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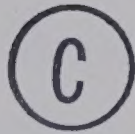
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SOME ASPECTS OF INDUSTRIAL LINKAGES IN
EDMONTON'S OIL INDUSTRY; WITH SPECIAL
REFERENCE TO THE TERTIARY SECTOR

by



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A THESIS

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ABSTRACT

THE UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled, Some Aspects of Industrial Linkages in Edmonton's Oil Industry; With Special Reference to the Tertiary Sector, submitted by Paul James Curtis, in partial fulfillment of the requirements for the degree of Master of Arts.

ABSTRACT

This study focuses on the causes for the location within Metropolitan Edmonton of two sectors of the productive stages of the oil industry with special reference to agglomeration and the external economies associated with such agglomeration.

The oil industry, on the basis of specific definitions was divided into four industrial sectors; primary, secondary, tertiary and quaternary. Oil establishments within the city were each assigned to one of these sectors and the two sectors secondary and tertiary were used as the basis for study.

Library research indicated that agglomeration is most likely to occur due to the presence of external economies with those associated with labour, transportation and close functional linkages being most often cited. To gain information with respect to locational factors, especially those associated with agglomeration, one hundred and nine oil establishments were interviewed.

The major findings of the research were;

1. Prior to the development of the oil fields within the immediate vicinity (100 miles) of Edmonton in 1947, there were few oil establishments within the city. In the following twenty-four years a sufficient number and variety of these establishments have located within Edmonton so that agglomeration can be shown to have taken place.

2. Of the two sectors studied, tertiary establishments are the most prevalent. Secondary activities of the productive aspects of the oil

industry are negligible within the city.

3. The most important location factor for the Edmonton establishments is that of accessibility to their markets.

4. Although not necessarily considered important in locational decisions, external economies, based on labour availability, have developed within the city.

5. Of recognised importance, but not of dominant proportions, are the external economies which have developed with respect to transfer economies.

6. Linkages have developed within the sectors under study. Of the three conventional linkage forms; horizontal, vertical and diagonal, diagonal linkages are the most prevalent. Of far greater importance, however, are communications linkages, especially of the face to face variety. Considerable effort and money is spent in cultivating and maintaining these links.

7. All the external economies have been developed by, and also have developed within, the sectors under study. The city of Edmonton is found to have nothing within it that contributes to the development or maintenance of the external economies and the resultant agglomeration which could be re-developed elsewhere should conditions warrant a move of the establishments from the city.

The study has left many avenues open for further research. A technique is needed for establishing the presence of agglomeration in industrial areas but this will not be possible until further research is undertaken into the nature of agglomeration.

With regard to the specific situation found within Edmonton,

research is needed on the development of transfer economies within the city, their causes and their effects, this from both a historical and an economic geographical point of view. Research is also needed on the Industrial Airport. The present study indicates that its need and worth is grossly over-estimated by local civic politicians, however, a different conclusion might be reached with respect to different industries, either individually or in aggregate.

Finally, the study has revealed the total inadequacy of available tools to handle the topic of communications linkages, which, in the present instance, have been shown to be of paramount importance in the daily operation of the establishments interviewed. The study has not shown how these communications linkages operate, nor what their total contribution to locational or operational decisions are. Further research is needed in this topic if the geographer is to fully appreciate all the factors that are involved in the location of establishments.

ACKNOWLEDGEMENTS

I am indebted to many persons for their contributions towards the completion of this thesis.

Special thanks go to my supervisor Dr. K. J. Fairbairn whose enthusiasm, dedication and constructive criticism, have contributed so much to the present study. To Dr. N. R. Siefried and Dr. R. Pendergast of my committee go thanks for their contributions.

Thanks go to my typist, Mrs. Sharon McKinley, whose transcriptions of English, American and purely Curtis spellings into an acceptable form required efforts far beyond the call of duty, and to Mr. J. Chesterman, whose technical excellence in the reproduction of maps and diagrams is self evident.

To the 109 businessmen of Edmonton's Oil Industry, who unstintingly gave of their time and effort, go thanks, for without their contribution, this study could not have taken place.

Finally to my wife Jean, go greatful and heartfelt thanks. She has uncomplainingly sacrificed her home, her friends and other material comforts in order that I might fulfil a personal ambition. She has at all times been a constant source of encouragement and without her the list of acknowledgements above would not have been possible. To my infant daughter, Jennifer, who has unwittingly contributed so much, go my thanks. Her childish innocence and her insatiable curiosity of the wonders of the world around her, have, at all times, helped to keep everything in its right perspective.

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CHAPTER ONE

INTRODUCTION

The term 'economic activity' is used by economists and geographers alike to indicate any undertaking by man, at any location, that is engaged in by him to either further his well-being or to gain a profit.

In terms of geographical enquiry, it has been suggested that,

"The word economic pertains to all activities that men engage in the world over in the production, exchange, and consumption of items of value. Anything man will pay money for, or will barter, or will work to produce is an economic item."

[Alexander, 1963]

Such a definition includes all of man's activity, for example, the manufacture of sophisticated aero-space components and the slash and burn agriculture practised by some primitive cultures. Because of this vast range of undertakings, the study of 'economic activity' per se, has proved unwieldy in terms of systematic study and especially so with the present trend of geographical research towards nomothetic studies. Except in terms of very broad concepts it is difficult, if not impossible, to try and derive laws and theories which are applicable to such diverse activities as the examples of aero-space component manufacture and slash and burn agriculture.

In an effort to divide 'economic activity' into manageable proportions, all those activities having certain common traits have been placed into a single category, while others with other common traits have likewise been categorised. Four categories or sectors of

economic activity have thus been delineated. They are; primary, secondary, tertiary and quaternary. These terms have been applied to all economic activities at all locations in order to help define the type of undertaking in which any particular group of persons or any single establishment is engaged.

Because the placing of individual establishments into one of the four categories is somewhat subjective, the terms in themselves are very loose and there do not appear to be any set standard definitions. Accordingly, for the purposes of this study, the following definitions will be applied.

Primary Activity

Included under primary activities are those activities which engage in the extraction of a raw material and pass it along to the next stage of production in an unchanged state. Alexander [1963] suggests the term 'harvesting' as a delineating factor. Thus an example of primary industry would be the mining of coal.

Secondary Activity

Secondary activities are those activities which utilise primary products and change their form in order to make them more useful. Implied if not stated in such a definition is the fact that some form of manufacturing or processing occurs during secondary activity and therefore value is added to the product. Also implied is the fact that a primary product may undergo many different forms of processing before reaching its final consumer. Examples of secondary activity would be the production of sheet metal or the making of furniture.

Tertiary Activity

Included under tertiary activities are those activities which both serve and service primary and secondary activities other than by either extracting or manufacturing products themselves. Establishments engaged in tertiary activities also tend to serve the general population in a more direct manner than do those engaged in primary or secondary activities. Examples of tertiary activities would be wholesale and retail establishments or manufacturers' service establishments which repair and service specific manufacturers' products.

Quaternary Activity

Establishments concerned with the collection and dissemination of information are engaged in quaternary activities. Examples would be research laboratories and professional consultants in specific activities such as engineering consultants who do not actually perform any 'physical' engineering but who gather information and advise on specific engineering problems.

Specific Area of Study

In asking the questions as to the where and why of activities, it has been the usual course of geographic enquiry to choose one specific industry and to study it, as far as possible in totality. Thus there are many studies to be found in geographic literature with titles such as, 'The Automotive Industry; A Study in Industrial Location' [Harley, 1967], 'Fishing in Japan' [Highsmith, 1961] and 'Volga River Transportation' [Taffe, 1964].

A slightly different approach taken by many writers is to centre their attention on the economic activity taking place in one

specific location, even though that particular activity is part of a greater whole. Thus instead of a general study on the Aluminum Industry, studies have been done on individual aluminum plants in specific places as exemplified by the study of, 'The Kitimat Aluminum Development' [Rudd, 1961]. Other examples of general studies of activities at specific locations are, 'Cotton in the San Joaquin Valley' [Large, 1957] and 'Vestergaard; A farm in Denmark' [Harte, 1964].

With either approach outlined above, treated incidentally, if treated at all, are the questions of whether the enterprise or specific operation under discussion falls into the category of primary, secondary, tertiary or quaternary activity or whether this categorisation has any bearing on either the location or the behavior of the operation. This is due to the ideographic nature of the studies where as much as possible has been learned about the specific operation or total industry under observation but little carry over of information has taken place between one study and another. Thus the fact that any industrial enterprise in question was a tertiary activity had little or no bearing on the study as a whole.

As previously mentioned, the present trend of geographical research is towards nomothetic studies. From such studies, laws and theories are derived which are then applied to similar situations at different locations. Thus physical geographers recognise Horton's Law of Stream Slope as being applicable to all streams all over the earth's surface, while human geographers recognise Reilly's Law of Market Size and likewise apply it to situations throughout the western world.

In nomothetic studies it is the patterns and relationships between observations that are important and thus in economic geography the research worker is looking for such patterns and relationships between economic activities. If such relationships are found to be present, whether they exist between different types of activities, for example between primary and secondary activities, or between similar types of activities, that is between two tertiary activities, it may help to explain certain characteristics about either the location or the operation of the establishments in question. Thus the fact of whether activities are primary, secondary, tertiary or quaternary in nature takes on added importance.

At the present time, little research has been done in this area, and this appears to be due mainly to a lack of theoretical background, which in turn is the result of lack of universal agreement over the category definitions and the placing of individual activities within these categories. It is felt, therefore, that the lack of emphasis on sectors of industry is due to a lack of a universally accepted theoretical foundation upon which studies can be built.

For example, in the case of wholesaling, an important sector of tertiary activity, it has been suggested that, "The basic inability of Christaller's theory to handle trades practised by agents, probably accounts for the almost total absence of geographical literature dealing with wholesaling" [Vance, 1964].

The following study is thus somewhat different in approach in that a specific industry such as the Aluminum Industry is not being studied as an end in itself and neither is any one particular establishment or operation. Instead, two of the four industrial sectors, those

of secondary and tertiary activities, are to be the focus of attention with the definitions previously outlined being used both as the basis of categorisation and also the basis upon which available literature has been drawn together to form a framework for the study.

As an economy matures, it is generally recognised that a larger and larger percentage of the working population enter into secondary and tertiary activities, and that, in a mature economy, these two sectors combined comprise the dominant percentage of the labour force. Thus in a mature economy such as Canada's, to study all secondary and tertiary activities in all branches of industry would require resources in terms of information, personnel and expense that are normally available only to governments.

To set working limits for the present study, it was decided to select one specific industry in one specific location and to study the secondary and tertiary activities associated with it at some depth. The industry chosen is that of the Oil Industry and the location is the city of Edmonton, Alberta. While to some degree an arbitrary one, the choice of the oil industry allows the study to have two inter-related focii. The first is to study the reasons for, and the effects of, the gathering together of secondary and tertiary establishments associated with the oil industry within the city of Edmonton, and the second is to study the habits and characteristics of secondary and tertiary industry in one location associated with one specific industry and to ascertain whether, in this particular instance, these correspond to expected behaviour and if not to try and discover why not.

Purposes of the Study

Much has been written by academics, politicians and economists about the decline of small towns and communities. Each small town is in its turn interested not only in surviving but also in promoting growth and does its best to attract new enterprises and developments. Governments at municipal, provincial and federal levels are busily exploring the possibilities for new developments and the 'growth pole' [Darwent, 1969] idea is prevalent in government thinking, especially in so-called depressed areas.

By studying the habits and characteristics of sectors of an industry in an already existing centre, it is hoped that insights might be gained into some of the factors that must be planned or allowed for in attracting new industries or developing new growth poles, for it is felt that planning must be based as much on the reality of what is, as it is on the theory of what might be.

Studies dealing with industrial location have traditionally approached the problem from the point of view of 'factors of production', that is, what is needed by an enterprise in order that it might function profitably. A list of these factors would include;

1. Raw materials:- a. number of them, b. quantities involved, c. source locations.
2. Site Requirements:- a. physical size, b. climatic limitations (if any), c. aspect, d. situation.
3. Power Requirements:- a. type of power, b. amount of power.
4. Waste Products:- a. amounts of, b. disposal of.

Some other factors that have to be taken into account are;

1. Labour Requirements:- a. quantity, b. quality (skilled or unskilled), c. sex.
2. Markets:- a. static or expanding, b. free or controlled (government intervention) c. local or foreign tariffs.

With the development of the growth pole idea, attention has been drawn to other factors which have long been known to exist but have often been little regarded. Two of the more important of these factors are those of agglomeration and external economies.

For example it has been suggested that,

"External economies of agglomeration and interindustry linkages are becoming increasingly important determinants of plant location in advanced industrial nations. They are tending to strengthen the advantages of a location in an existing industrial or metropolitan area for industries with complex input-output relations with other activities, thus reducing plant mobility to some extent. External economies are also among the most important factors affecting industrial location in developing nations".
[Smith, 1971]

Further to this point it has been suggested that,

"There is considerable evidence that in many cases, external economies can more than compensate for higher rates of transport, labour, or other factors of production from the point of view of the firm or the project. From the point of view of national regional development policy, an understanding of the elements of external economies probably contains the answer to the crucial questions of whether the principal cities are too big; of how big secondary centres must be to enjoy self sustaining growth and what types of industry are proper subjects for the policy of decentralisation and at what stage of their evolution"
[Alonso, 1968]

Again,

"In other words, the understanding of external economies is an important ingredient in the solution of most of the major problems of industrial development planning strategy..."

and further

"There seems to be little doubt now that the most effective strategy for planned industrial development is to create a

growth point (or system of such points) based on a carefully selected group of inter-related activities and large enough to benefit from external economies of agglomeration."

[Smith, 1971]

The present study is an attempt to discover whether or not agglomeration has taken place within the secondary and tertiary sectors of the oil industry as it is located within the city of Edmonton; further to try and identify whether external economies have developed within those sectors, and if so, of what type.

CHAPTER TWO

EDMONTON AND THE OIL INDUSTRY

Chapter two is an attempt to set the stage for the study and briefly traces Edmonton's development as an oil centre. A thumbnail sketch is presented of the oil industry in its exploration and productive stages indicating some of the operations undertaken and the supplies needed in the quest for oil.

The Origin and Functional Development of Edmonton

At least five attempts were made to locate Fort Edmonton in the general area of the present city with the final successful attempt occurring in 1821. Settlement in the immediate vicinity of the fort, (located on the north bank of the river) began during the 1870's and by 1880 the centre had a population of approximately 300¹. In 1871 a Canadian Pacific Railway spur line reached Strathcona on the south side of the river opposite Fort Edmonton. This community was annexed by Edmonton in 1912. With the formation of the province of Alberta in 1905, Edmonton was selected as the capital city and in that same year the Grand Trunk Railway reached the city.

During the period 1905 to 1930 railway expansion in the province was accompanied by the rapid settlement of central Alberta with Edmonton gaining importance as the service centre for the mixed farming

¹A detailed history of the city of Edmonton can be obtained from Edmonton; A History, 1967, McGregor, J., Edmonton, M. G. Hurtig Co.

economy of the region. The opening of the Peace River area, approximately 300 miles to the northwest of Edmonton, greatly expanded the city's hinterland especially after the completion of the railway to the Peace River District in 1914. Edmonton's role as a communications centre is illustrated by figure 2 - 1.

Due to its geographic situation, Edmonton, since its founding has always been important as a hub for the movement of supplies to the north. The city is the major northern air terminal in Canada and is served by two commercial and two military air ports. The Alaska and MacKenzie highways both lead north from Edmonton. The Northern Alberta Great Slave Lake Railway and the Northern Alberta Railway move goods north to Pine Point and Fort McMurray respectively with both railways terminating in Edmonton. Finally, Edmonton is also the distribution centre for the MacKenzie River system to the Arctic and the Northwest Territories with supplies moved by barge from Fort McMurray and Hay River. [Laatsch and Gill, 1971]

The Development of Edmonton as an Oil Centre

Although some exploration and some discoveries (notably the Norman Wells strike of 1920) had created interest in Edmonton, it was not until the Leduc discovery of 1947 that Edmonton began its development as an oil centre.

The following table indicates the number of establishments directly related to the oil industry that were located in Edmonton prior to 1947.

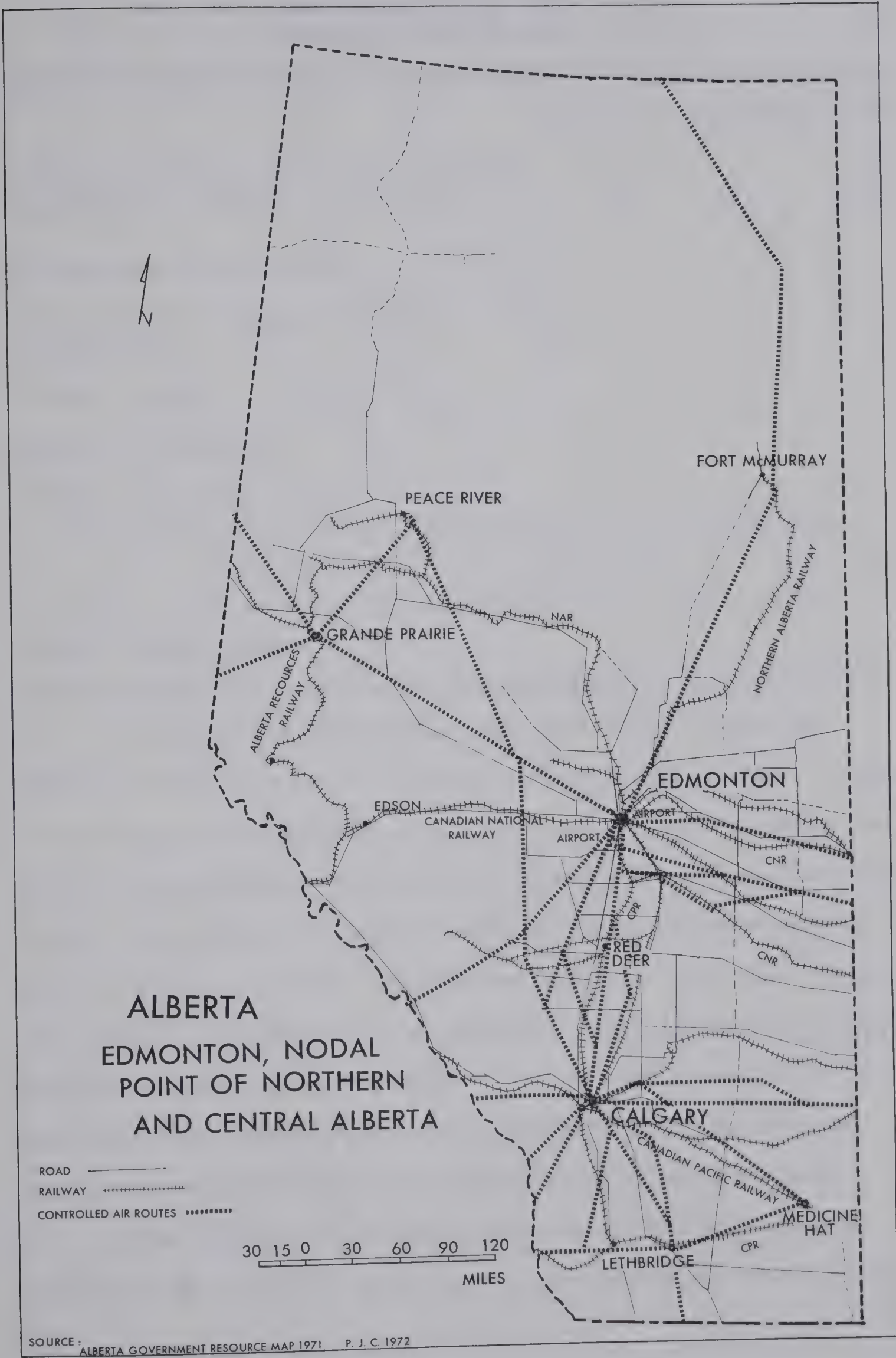


Figure 2 - 1

TABLE 2-1 - OIL OFFICES OF ALL TYPES LOCATED
IN EDMONTON PRIOR TO 1947

	1925	1930	1935	1940	1945
Oil Companies (Producers, Explorers, Developers)	2	4	4	5	7
Oil Brokers and Land Agents	2	-	-	-	-
Oil and Gas Well Supply, Equipment and Services	3	2	1	1	-
Oil Well Drillers	-	1	-	-	-
Natural Gas Companies	1	1	1	1	1
Refiners and Distributors	2	3	9	11	11
	10	11	15	18	19

Source: Zeiber, 1971.

Following the Leduc strike, many activities directly and indirectly related to the oil industry located within the city. Several oil strikes followed in quick succession after the Leduc discovery and within a decade Edmonton was surrounded by major oil and gas producing fields. The location of the most important fields is illustrated by maps 2-2 and 2-3. In 1971, the Edmonton Industrial Development Department estimated that there were approximately 7,000 producing oil wells operating within a 100 mile radius of the city, while Lenz [1963] reported that about seventy per cent of Alberta's total petroleum production occurs within a radius of less than 100 miles of the city.

The many oil and gas discoveries rapidly led to Edmonton's development as a refining centre and the city has become the centre of

approximately 10,000 miles of major oil and gas transmission pipelines besides the hundreds of miles of field gathering lines.

The Impact of the Oil Industry on Edmonton

Between 1945 and 1970, the population almost quadrupled within the city, from approximately 115,000 to 422,500. During this same period, the number of companies directly involved with the oil industry rose from 19 to 830 [Zeiber, 1971].

The immediate effects of the oil strikes between 1947 and 1955 on the city population has been described as follows,

"Edmontonians lived in a dream world. Every month brought some fresh discovery, and every month saw more drilling rigs coming in, more low-boys and more pipe and casings rumbling by on huge trucks. Every week saw some new warehouse going up in frantic haste to service the new fields...thousands of workers came to labour in the wholesale trade catering to the oil industry. Many others found work transporting oil equipment or servicing or repairing it. To them were added the hosts of others to build the thousands of miles of pipe lines, the new factories and the new office buildings, all directly related to the oil industry."

[McGregor, 1967]

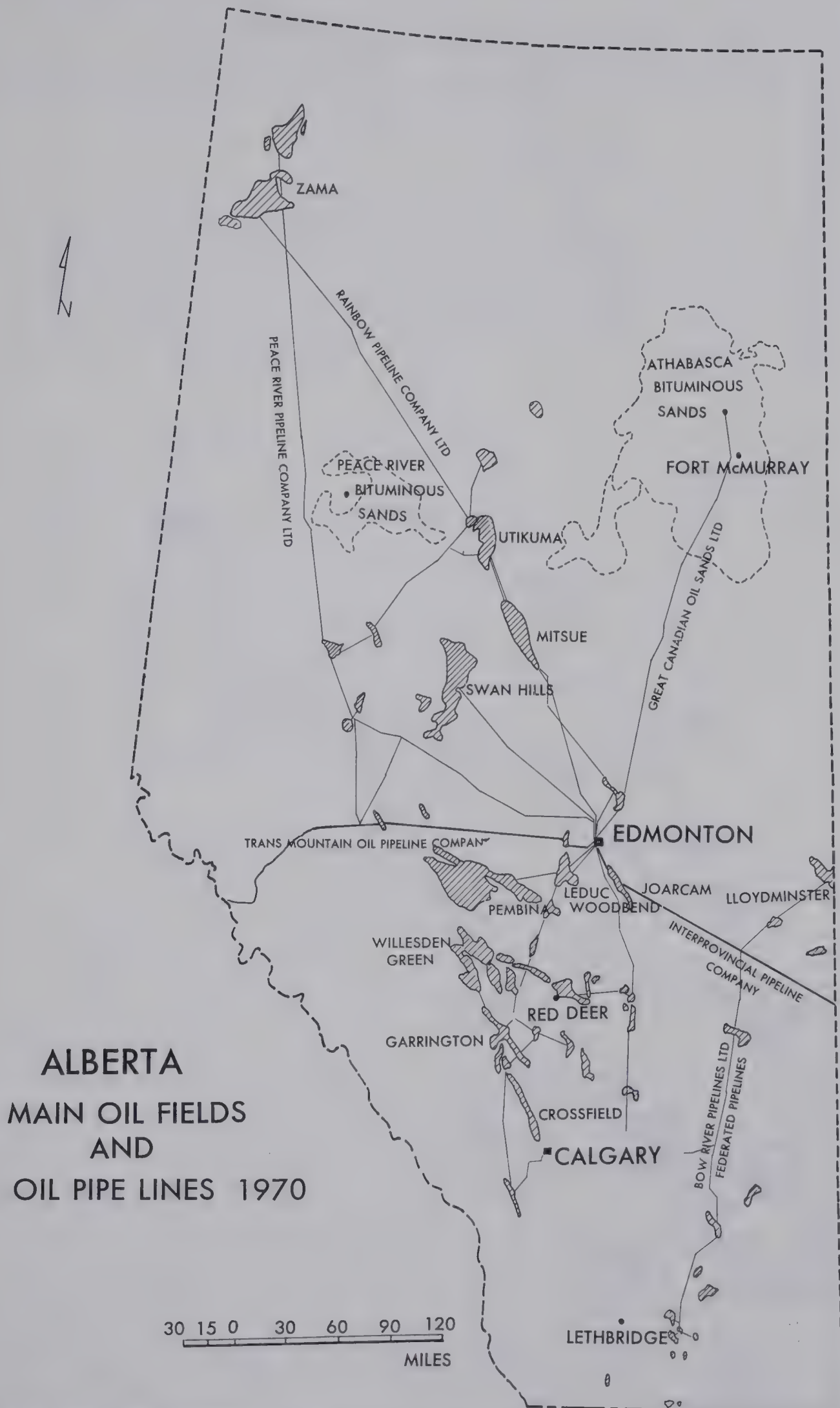
Edmonton by 1956 had crowned itself 'Oil Capital of Canada' and had acquired the reputation of being the operations centre for the industry as opposed to Calgary's claim of being the administrative centre.

"Edmonton became a refining and petrochemical centre and the main base of operations for the operations of oil industry contractors..."

and further

"The petroleum industry employs large numbers of workers in many ways. They are to be found in construction, manufacturing, processing, transportation, wholesaling, retailing, finance, governments and practically all categories of the labour force."

[Hanson, 1957]

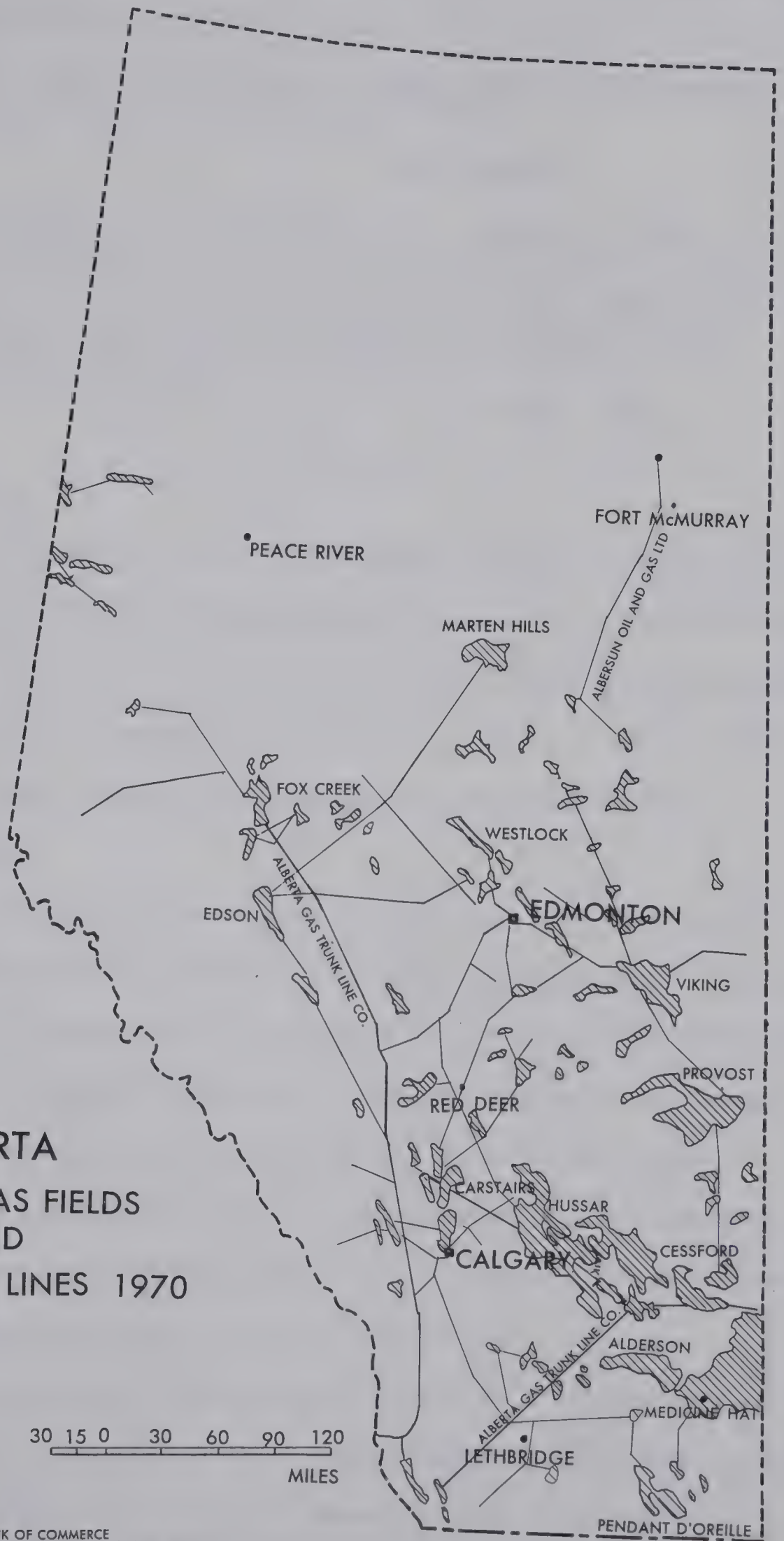


SOURCE : CANADIAN IMPERIAL BANK OF COMMERCE,
OIL AND GAS DIVISION, 1971 P. J. C. 1972

Figure 2 - 2

ALBERTA MAIN GAS FIELDS AND GAS PIPE LINES 1970

30 15 0 30 60 90 120
MILES



Hanson's comments have been substantiated by the suggestion that Edmonton is the,

"Principal supply, distribution, repair and secondary manufacturing centre for the petroleum industry".

and further

"Secondary manufacturing equipment and supplies for the petroleum industry such as steel and plastic pipe for the oil and gas lines, parts and equipment for drilling rigs, wells, gas plants and pipeline pumping stations, storage tanks and portable camp facilities has created major industries for both Calgary and Edmonton."

[Gray, 1964]

The Oil Industry

Most persons are aware of the importance of oil and its products in a modern society and most would like to have oil discovered on their property for the revenue that such discoveries bring, but beyond a few broad generalities, knowledge about the oil industry is limited and indeed it has been termed, "the industry no one really knows" [Thompson, 1956].

The industry can broadly be divided into four divisions of activities, exploration, production, refining and marketing. Some of the larger oil companies such as Standard Oil of New Jersey and Royal Dutch Shell Oil Company, are termed integrated companies and engage in all four facets of the industry. By and large however, the exploration and productive aspects of the oil industry are dominated by small independent companies that engage in one or a few operations associated either with exploration or production.

Since Edmonton's contribution to Alberta's oil industry is mainly that of a production service centre [Hanson, 1957; Gray, 1964], the following study is based on the manufacturing and servicing

establishments primarily associated with the productive facets of the oil industry and the following paragraphs briefly indicate some of the operations undertaken and the supplies and services needed in exploring for oil and in drilling a well.

Exploring for Oil

Before drilling is commenced, the precise location of where to drill has been carefully derived by crews of geologists, some of whom have gathered information and some of whom work in laboratories and analyze samples sent in from the field crews. The exploration phase of oil production uses equipment as diverse as aircraft and gunpowder. Aerial photographs are taken of the selected area and magnetometers suspended from aircraft make magnetic field maps of large areas. These are complemented by large scale maps produced of specific areas by crews using ground magnetometers.

Seismic crews using small charges of explosives produce charts which indicate anomalies in sub surface rock structure. Rock and core samples are analyzed to gather information as to age and formation processes. In the laboratory, electron microscopes, x-ray techniques and other sophisticated machinery is brought into play [Ball, Ball and Turner, 1964] so that by the time all the information has been gathered the geologist has as complete a picture as is technically possible of the surface and sub surface structure of the selected area.

Once all this information has been gathered and analyzed, the geologist is in a position to indicate that on the basis of what he knows, there is a possibility that oil might be found, and thus sets

in motion a gamble that can cost upward of two million dollars, for even with all the knowledge gained it is still not possible for a geologist to know definitely whether or not oil or gas will be found.

Preparation for Drilling

Having selected a site for drilling, a preparation crew is sent in to clear the site, provide access roads and set up facilities. This crew uses equipment familiar at most construction sites. Bulldozers, graders, cranes and trucks are all in evidence as are piles of lumber and other construction materials. At the actual well site, the preparation crew may be required to prepare a foundation and construct a cellar over which the drilling rig will be built and in which is housed machinery to prevent well blow outs (the uncontrolled escaping of oil or gas) and other safety equipment.

Well site requirements vary with the nature of the well to be drilled, some of which are drilled from rigs mounted on the back of trucks and are known as slim bore holes. Other rigs contain upward of two hundred tons of structural steel and require precise well site construction.

Drilling for Oil

Once the site has been chosen and prepared, the building of the rig commences. No two rig platform layouts are the same with the positioning of various parts depending upon the instruction of the chief driller. Where he wants things and why are the result of many years experience gained on the rigs, for his is the ultimate responsibility for the working of the rig. "Half a million dollars or more is

invested in a drilling rig. It serves no other purpose than to drill a hole and it is useless in any other industry". [Petroleum Extension Service Booklet, 1957].

On the rig floor are the power systems needed to drive the bit, light the rig (drilling being a twenty-four hour operation) and circulate the drilling 'mud', which is any form of solid suspended in water, and used to wash the bit and carry away the drillings. The type of 'mud' depends upon the type of formation being drilled.

Supplies and Personnel Required in Drillings

Some of the supplies needed to complete a 10,000 foot well include; 14,000 feet of drill pipe, in twenty, thirty and forty foot lengths which can weigh anywhere from six to twenty-five pounds per linear foot; 10,000 feet of seven inch casing pipe², 550 feet of five inch liner pipe and forty feet of twenty inch conductor pipe. As much as 7,500 feet of wire cables are required along with 1,000 feet of manila rope. Also needed are 5,000 sacks of cement (or their equivalent in ready-mix mixtures), five tons of saw dust, five tons of cotton seed bulls, 250 tons of various chemicals solids, 800 tons of 'mud', 240,000 gallons of water, 1,500 gallons of diesel fuel plus many other miscellaneous items such as lubricant oils, sand, gravel and cleaning rags.

For the actual drilling operation, drilling bits are required, the nature and construction of which depends upon the formation of the

²Well completion; if a pay zone is discovered and the well is completed, a steel casing is put down the hole to prevent cave ins. Around the outside of the casing, cement is poured.

rock being drilled. Drilling collars used as weights and weighing anywhere from two to twenty tons are added to the bits and a drill stem including bits, weights and drill pipe can weigh upwards of 200 tons.

If a bit meets an obstruction in the well or if the drill breaks and blocks the hole, an operation termed 'fishing' must be undertaken to clear the hole. "There are as many tools for fishing as there are fish to be recovered. For every fishing job that occurs, the drillers can usually find a tool to handle it".

[Petroleum Extension Service Booklet, 1957].

Besides the equipment used on the well itself there is also the equipment needed to transport and maintain it. Trucks and cranes, welding outfits, electrical supplies and mechanics to operate the equipment are all required.

The rig needs equipment ranging from electric light bulbs to blocks and tackles capable of supporting 200 tons, from nuts and bolts to gauges and shut off valves.

"While the rig is making hole, there will be representatives of bit companies, 'mud' engineers, chemical products salesmen and other men constantly visiting the well...the drilling company works also with various service companies who do work on the well while the rig is still on location. Among such companies are, perforators, acidising crews, loggers, drill stem testing crews, fracturing companies, directional drillers and many others."³

[Petroleum Extension Service Booklet, 1957]

³Perforators; Once a well has been completed it is necessary to open the base of it to allow the oil or gas to enter into the extraction pipe (during completion this is sealed or plugged). This is done by perforating companies who use explosives or other techniques.

During the drilling operation, it is essential to the drilling crew that the equipment be in top running order and that all supplies and replacement parts are readily available, for a day's delay can mean losses of upward of 200,000 dollars [Petroleum Extension Service Booklet, 1957]. Because the need for supplies is so crucial, each rig has associated with it a man aptly known as a 'tool push'. It is his responsibility to maintain full inventory at the well site from the day the site is selected to the day the well is completed and to acquire emergency requirements in the least possible time. The tool push has no other function but his is a twenty-four hour a day job.

If a pay zone is located, the well is completed and capped

If a pay zone is located at more than one level, perforation may be required at various depths.

Acidising; If a well does not flow due to poor permeability of the rock formation, acid may be pumped into the formation to dissolve it and thus increase permeability and flow.

Fracturing; Another way of increasing permeability. Liquid is pumped into the formation under tremendous pressure, literally causing the formation to fracture.

Logging; Electrical characteristics are measured of the formation through which the hole is being drilled. Mud logging measures the electrical characteristics of the drilling mud which carried formations drilled from the hole.

Drill Stem Testing; Cores are taken from the hole and are analyzed as to formation.

Directional Drilling; It is sometimes necessary to drill at an angle rather than vertically. Using specially jointed equipment it is possible to drill at almost any desired angle. This technique is sometimes used to by-pass an obstruction in the hole if 'fishing' techniques prove unsuccessful.

with a device known as a Christmas Tree. This device consists of a series of pipes, valves and gauges which allows operators to turn the well on or off, service it or by pass it, and by means of the gauges, see exactly what is occurring many thousands of feet below the surface.

Oil Movement

Rarely is the oil refined at the site of its discovery; normally it is moved via pipe lines to a refinery which may be just a short distance or hundreds of miles away. Usually a pump is located at the well head (although occasionally the oil rises under natural pressures) to bring the oil to the surface and then it is pumped into collection lines which may lead to a storage tank or directly to a main line. From either the storage tank or directly from the main line, the oil is eventually transported to a refinery. The construction of pipelines requires special pipe laying equipment. Also needed are valves and pumps, welding equipment and the men to operate it.

Thus the oil industry in its productive stage requires supplies of a varied and complicated nature, some of which are large and bulky, others of which are small and very sophisticated in construction and operation. The oil field supply house is therefore an integral part of the industry for it must have at its disposal access to all these parts on a twenty-four hour basis.

Summary

Chapter two has traced the development of the city of Edmonton as an oil service centre and has briefly indicated some of the requirements needed by the industry in its quest for oil. The sections dealing with oil exploration and production have stressed the complexities

involved and have shown how many different operations and techniques are required in the successful completion of a well. Thompson [1956] has suggested that it takes the knowledge of forty-eight specialists for such a completion.

Because of the complexities of the operations and the numbers of them that are involved, it becomes evident that the operators must work in close liason with each other. Thus the location of their offices and supply depots relative to each other and also relative to their operation sites becomes an important consideration.

While drilling for oil and oil production fall within the category of a primary activity, the construction of rigs, of site facilities and of specialised machinery are properly secondary activities. Well servicing and completion, repair and servicing of equipment and supplying all facets of the industry fall within the tertiary sector of industrial activity as defined in the introduction as does the transportation industry directly associated with all oil activities. Geologic surveying and analysis in turn are quaternary activities as defined so that all four industrial categories are represented within the oil industry. How these activities work together, but primarily those associated with the secondary and tertiary sectors, will be the subject of the remaining chapters.

Chapter three turns to the theoretical framework within which the study was built and indicates how the study was undertaken.

CHAPTER THREE

THEORETICAL FRAMEWORK AND METHODOLOGY

Theoretical Aspects of the Study

As previously stated, studies dealing specifically with sectors of industry, their habits and characteristics are apparently unavailable. However, in several studies both of specific industries and of industrial location generally, passing references are made to industrial sectors with hints as to what might be expected in terms of location and characteristics. Within the limited number of references available, two of the more frequently mentioned characteristics are those of the tendency for the sectors under consideration to agglomerate and to create linkages between themselves.

Some idea of the gap in the literature on the subject at hand can be gauged by the fact that in a publication of 1967, entitled, 'Industrial Location, A Review and Annotated Bibliography of Theoretical Empirical and Case Studies', edited by Benjamin H. Stevens and Carolyn A. Bracket; of 742 listings, only thirty-five were grouped as having anything to do with agglomeration, linkages or both. This represents less than five percent of the total.

From several of these works, plus general sources of which, 'Location Theory and the Shoe and Leather Industry' [Hoover, 1937], 'The Location of Economic Activity' [Hoover, 1948], 'Industrial Activity and Economic Geography' [Estall and Buchanan, 1961], and 'Regional Economics' [Nourse, 1968] are some of the more important examples, the

following theoretical background has been drawn together.

Briefly summarised, the theory suggests that secondary and especially tertiary industry is generally market orientated. In this respect the two sectors are similar to quaternary activities which also tend towards market orientation but are different from primary activities which tend to be raw materials orientated. The theory also suggests that the sectors tend to agglomerate at one location and at that location to both create and be subject to external economies.

The following series of quotes, taken from various sources help to substantiate the above summation.

Abler, Adams and Gould [1971] state, "Tertiary activities usually locate close to their clients." Hoover [1948] suggests, "Most trade and service activities are more closely orientated to consumer markets than manufacturing industries as a class and are, perhaps, less likely to be footloose." Guthrie [1963] suggests, "A plant close to markets can give faster service to its customers." Alexander [1961] states emphatically (by means of italics to draw his readers' attention) that, "Tertiary activities tend to agglomerate", and further, "Rarely do tertiary agglomerations consist solely of tertiary activities. At least in larger settlements a modicum of manufacturing is usually present as well as some commercial transportation." E. A. Ross [1903] suggests that, "A dispersed activity concentrates in one place i.e. localises, because of the many economies that result from the dwelling together of many enterprises of one kind in the same neighbourhood."

Complementing this statement, Guthrie [1963] states, "Local concentration of an industry in an area is likely to result in the development of firms making specialised machinery for that industry. Substantial savings to all firms of an industry located in one area may result from the fact that there are several firms specialising in the replacement and repair of the machinery used in that industry." Finally Beckmann [1963] states, "Local concentration of industry in general may allow the splitting off of specialised activities, transport and loading facilities, training schools and repair shops. These generate well known economies of scale in an industry which are 'external' to the individual firms making up the industry."

The specialisation of firms implies the development of linkages between the firms involved. This development centred around a growth industry was illustrated by Thompson [1966] in 'Urban Economics Growth and Development'. Briefly summarised, Thompson's model is centred around three meat products firms. These in turn attract butchers who in their turn attract a firm specialising in meat cutting tools. A machinery firm specialising in the manufacture of the tools is in turn attracted to the community. A further spin off from the meat industry is the development of a leather industry and this in turn develops a shoe industry.

Thus Thompson's model derives a thriving and growing community based on a series of close functional linkages and external economies.

External Economies

It has been stated that the concept of external economies is one of the most elusive in economic literature.

"Definitions of external economies are few and unsatisfactory. It is agreed that they mean services and disservices rendered free (without compensation) by one producer to another; but there is no agreement on the nature and form of these services or in the reasons for them being free."

[Scitovsky, 1954]

A similar confusion and lack of literature also exists in geographical enquiry and therefore for the present study a definition will be derived from available sources.

Whenever a firm or an establishment brings about an increase of revenue over expenses by increasing the efficiency of some facet of a particular operation, it is said to have achieved an economy of scale.¹

Economies of scale are further divided into two sub groups; Internal Economies of Scale and External Economies of Scale. Internal Economies of scale are usually associated with larger industrial concerns where, for example, a machine may be introduced into a plant that will perform the task of three existing machines, doing it at a faster rate and employing less personnel to keep it operative. If, when comparing total costs between the new machine and the older ones, a saving occurs with the new, then the firm has achieved an internal economy of scale.

¹Economies of scale are defined as being an increase of revenue over expenses due to an increased efficiency of various facets of a company operation. Such economies can occur in management, in purchasing, in marketing or in the manufacturing process. For example, mass production allows that up to a certain level, the average cost of producing a given commodity decreases with the increase of the number of commodities produced. This is because it costs the same amount to produce a tool necessary to construct one item as it does to create the same tool to produce one hundred items but whereas one item must bear one hundred percent of the cost of tool production, one hundred items each bear only one percent of the same cost.

External economies can be defined as the advantages and disadvantages that arise from the association of two or more establishments, whether that association be in a physical sense, for example, by being in immediate proximity to each other and thus share common facilities, by using common supplies or a common labour pool, or, in the sense of close co-operation, for example the free exchange of information and ideas.

"It is not only hard to measure these advantages and disadvantages it is often hard to identify them!" [Alonso, 1958] This quote taken from Alonso's book, 'Plant Location', is repeated in many forms in different sources.

It has been stated that,

"External economies exist whenever the output of a firm depends not only on the factors of production utilised by that firm but also on the output and factor utilisation of another firm or group of firms."

[Meade, 1952]

Such external economies are termed 'technological' external economies and are the only external economies that can arise because of direct interdependence among producers. (Technological external economies are separated from pecuniary external economies by Lichtenberg [1951] on the basis of two sets of circumstances. Pecuniary external economies are associated with the rapid development of underdeveloped nations and are not applicable to the present situation). Whether they are identifiable at each, or any location, four main forms of external economies are generally recognised to exist. The four are;

- a. External economies centred on a basic raw material supply.
- b. External economies based on labour supplies.

- c. External economies based on transfer costs.
- d. External economies based on linkages.

Since the present study is concerned with secondary and tertiary activity, the first case listed above is not applicable except in that a raw material is normally fixed in location and draws other activities to that location. Because linkages, although properly regarded as external economies, are to some extent unique and are especially important to a discussion of agglomeration and the behavior of establishments, they will be treated under a separate sub-heading.

External Economies based on Labour Supplies

No single establishment or complete industry can exist without the use of labour, the type (skilled or un-skilled) being dictated by the type of establishment under consideration. Thus whenever an establishment decides to locate, it does so in the knowledge that:

1. there is an adequate labour supply in terms of numbers and sex at the location,
- or
2. there is an inadequate supply indicating that labour must be attracted from elsewhere.

In case 1, the labour supply can be of two main forms:

- a. already skilled in the requirements of the firm,

or

- b. unskilled in these requirements indicating the necessity of establishing a training programme.

When an establishment can locate where there is an adequate supply of labour already trained in its requirements, it is released from the expense of either attracting or of training labour and thus reduces its initial entry costs. This saving is also carried over whenever it becomes necessary to hire additional personnel. The new establishment thus enjoys an external economy, for initially someone had to both attract and train the labour.

External Economies based on Transfer Costs

The overriding importance of transfer costs in individual location theory pervades most writings on the subject whether approached from a purely economic or from a spatial point of view.

Except under the conditions where there is a single raw material and a single market which coincide, the entrepreneur is faced with the decision of moving something, somewhere. Whether this is the movement of one or all of the raw materials, the finished or semi-finished product or the movement of labour depends very heavily on the cost of transfer of the commodity in question and the distance that it is to be moved.

In way of explanation, the following list is meant to be illustrative rather than exhaustive of some of the factors that effect transfer costs.

1. size of shipments, vis-a-vis bulk and weight.
2. perishability of shipment.
3. value of shipment, vis-a-vis bulk and weight.
4. speed of delivery required.
5. regularity of shipments.

6. mode of transport.

The term transfer cost has been used rather than transport cost and it is necessary to differentiate between the two. Transport costs are those costs accruing to an establishment when a commodity is picked up, moved and delivered. Transfer costs are transport costs plus those additional costs that accrue if the establishment finds it necessary to build and maintain storage and terminal facilities plus the personnel to operate these facilities. Further, it includes such costs as insurance of things to be moved and value lost during movement. For example, during the time that structural steel is in transit it can not be used and thus capital invested in it is lost for that period of time.

Not all firms would be able to exist if they were forced to make expenditures in the construction and maintenance of terminal facilities and to purchase, maintain and operate company vehicles. To fill a need, therefore, private carrier firms may develop in an area and serve the establishments in question. Admittedly the establishments using the private carriers still pay some terminal and operative charges which are hidden within freight rates charged, but these charges are spread over many establishments and thus each individual establishment is afforded a saving or an external economy.

For example,

"The small firm in a given industry usually needs the fractional use of transportation facilities, it is likely to use less than car load and less than truck load transportation to a greater degree than its competition. In securing the fractional use of this sort, the small firm can often obtain better service and better terms in the centre of a large metropolitan area than either at the periphery or in smaller metropolitan areas. For the volume of business in large metropolitan areas develops enough specialists

in this type of transport to introduce scale economies and to push down rates and services towards levels more nearly competitive with the results and services available for the car load and truck load lots. Thus external economies in the metropolitan core are substituted for scale economies elsewhere."
[Vernon, 1957]

Agglomeration²

An attempt to formulate a general theory of agglomeration appears early in the literature dealing with industrial location, being an integral part of Alfred Weber's treatise, "Theory and the Location of Industries". His basic hypothesis however, has, almost from its very outset, been attacked on several fronts, the three main ones being:

1. His treatise failed to differentiate between different forms of agglomeration.

For example it has been suggested that,

"Agglomeration is a word used by Alfred Weber to cover three distinct situations. There is first, the case of the single establishment of the plant, bringing into existence the advantages of large scale production. There is, second, the local association of several plants, presumably of the same industry, which encourages the development of technical equipment and facilitates the sale of finished products. And there is third, the case in which the mere aggregation of manufacturing activities of unrelated as well as related types, leads to conditions which are on the whole more favourable than any single plant or group of related plants could develop for itself."

[Dagget, 1928]

²By agglomeration is meant the gathering together of two or more establishments at one particular locale in order that a mutual benefit may accrue to the establishments so agglomerated. The term concentration is found in the literature to be used inter-changeably with the term agglomeration; however for the purposes of this study, concentration simply implies the gathering together of establishments at a single locale. Where, in fact, concentration has taken place, the possibilities that agglomeration has occurred are very strong but the former does not necessarily imply the latter.

2. As a second criticism, Weber's treatise is based on a single simple cause, that of transfer costs, and takes no account of other real or possible causes for agglomeration.

3. By constructing isodopanes (lines joining points of equal transfer costs) Weber produced zones in which agglomeration could take place but left the discussion at that point without indicating possible or likely locations within the zones where agglomeration would take place. Conceivably the zones could cover several square miles and contain one or more centres of population, yet Weber's theory gives no clue as to which centre may become the focus of agglomeration or whether, in fact, a new centre might be created.

This third point is particularly pertinent to the question at hand when taking into account that the town of Devon, just eleven miles to the southwest of Edmonton, was especially created by the Imperial Oil Company in 1948 specifically as an oilfield servicing town. A tour around the town in 1971 shows just how far from serving that function it has now become. Conceivably, the town and Edmonton might be in one of Weber's zones of agglomeration but it is necessary to go outside his treatise to look for explanations for the demise of Devon.

In failing to differentiate between different forms of agglomeration as outlined by Dagget, that is, internal agglomeration, localisation agglomeration and urbanisation agglomeration, Weber's treatise becomes almost unmanageable.

It was, however, a starting point and apart from his early attempt there has been no further attempt to formulate a general theory of agglomeration. This lack of general theory has been noted,

"No single theoretical statement can give a complete description of the characteristics of agglomeration economies; what are their sources; at what level of concentration do they commence; on what does their rate of change depend. This is because the answers to these questions are likely to vary with the industry and the locations studied."

[Marcus, 1961]

Because of the lack of available theory in attempting to discuss agglomeration, it is almost always necessary to begin with Weber.

Linkages

One of the more easily explained reasons for industrial agglomeration is that of linkages. Although, as previously stated, linkages are a form of external economy, their importance merits that they be treated separately.

"Traditionally location theory regards as awkward exceptions the complex agglomerations that are supposed to be based upon the principles of external economies of scale and close functional linkage. Nevertheless, there seems to be every reason for regarding them as of central importance in modern location decisions."

[Wood, 1970]

Wood further deliniates types of linkage which he summarises under the headings of;

1. Process linkages, the movement of goods between different firms as stages in the manufacturing process (including subcontracting).
2. Service Linkages, the supply of machinery and equipment, and of auxiliary parts such as tools and dies, as well as repair and maintenance requirements when supplied by separate firms.
3. Marketing Linkages, ties with other firms that aid in the selling and distribution of goods (e.g. packers, printers, wholesalers agents and transportation concerns).

4. Financial and Commercial Linkages, ties with financial and advisory services such as, banks, insurance companies and stock-brokers.

Linkages, like external economies generally, are often very hard to identify since there may be little external evidence in an establishment's day to day operation that it has functional links with other establishments. However three main forms of linkage have been generally accepted and these are illustrated in figure 3 - 1.

Estall and Buchanan [1961] name them vertical, horizontal or lateral, and diagonal linkages, while P. Sargeant-Florence [1951] terms them vertical, horizontal and convergent linkages. Other forms of linkage have been defined but have not received general acceptance and so will be treated separately.

Vertical Linkages

By vertical linkages is meant that a series of operations is undertaken by successive plants in the production of a product, with each individual establishment providing as its finished product the raw material for the next higher productive stage. An illustration of vertical linkage might be found in the commercial drug industry where a particular drug is either extracted or synthesised (if extracted the source may have initially been grown or cultivated), refined, processed into marketable form i.e. pills or ointments, packaged and finally sold.

Horizontal or Lateral Linkages

The second form of linkages occurs whenever separate establishments each produce individual, separate and finished members of a final

Figure 3 - 1

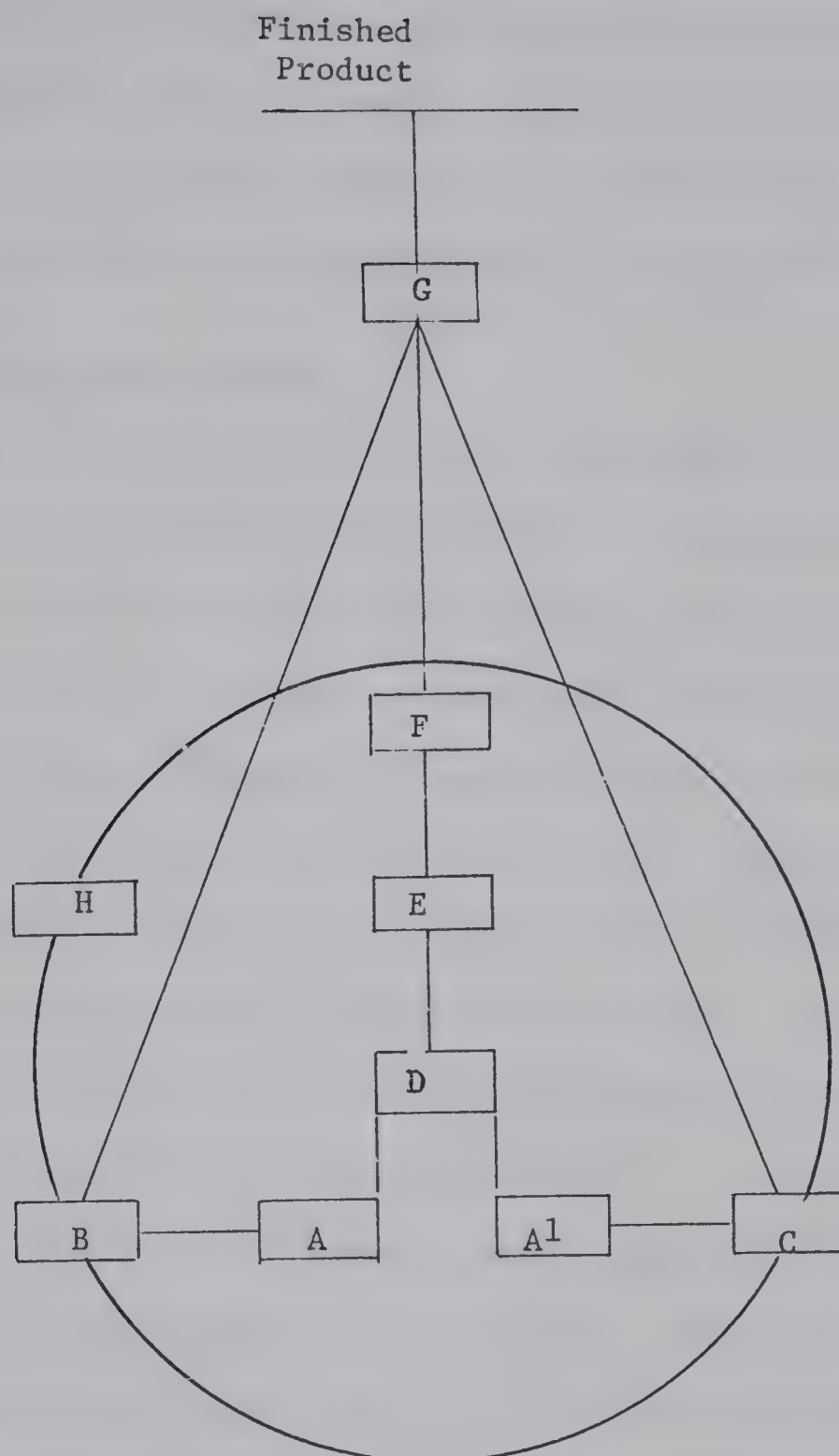


Figure 3 - 1 illustrating the three main linkage types.

Establishments A, A¹, D, E and F represent establishments engaged in an operation utilising a vertical linkage pattern. For example, the finished product of establishment D is passed on to establishment E for further processing.

Establishments B, F, and C represent establishments engaged in an operation utilising a horizontal linkage pattern. The finished products of these plants are gathered together and assembled into a final product in establishment G.

Establishment H represents a wholesale establishment catering to establishments A to F inclusive and thus maintains diagonal linkages with them.

product which is then assembled elsewhere. Thus, although each individual product is separate, it is governed in size, in shape and perhaps in colour by the requirements of the final assembled product. This type of linkage is well illustrated by the automotive industry with its many producing establishments and final assembly plants.

Diagonal or Convergent Linkages

A third linkage is a diagonal or convergent type. This entails an establishment producing either a product or a service which is required at more than one stage in the vertical process or more than one link in the horizontal process, but which does not in itself form a link in either chain. Diagonal linkages are well illustrated by any wholesale operation which caters to a particular industry.

A fourth type of linkage which Erstall and Buchanan [1961] identify, is termed, by them, a common roots linkage wherein two (or more) industries which are unrelated in most respects utilise in their production some skill of the manufacturers which can be translated from one industry to another. An example quoted suggests that the gunsmiths and locksmiths of Birmingham (England) utilise similar skills in producing divergent products. Such a linkage does not appear to have received wide recognition, one possible reason being that since the two industries are not linked either in product or organisation, the common tie benefits the two only as an external economy based on labour mobility. Thus while the external economy is beneficial to the industries in question, it is not properly a linkage.

A further linkage identified by Sargeant-Florence [1951] and termed by him a divergent linkage, suggests that a second establishment

might associate with an original one on the basis that the waste material from the established plant provides the raw material for the new plant. An example of such a divergent linkage would be the establishing of a specialised paper producing plant (using waste cotton material as one of its inputs) beside a complex making mass cotton goods.

Like common roots linkage, divergent linkages have not received much attention in the literature, possibly on the same grounds, that is, that in neither products nor organisation are the firms linked. More likely the reason for the lack of acceptance lies in the fact that the situation is felt to be covered by the explanation given for vertical linkage. The explanation nowhere suggests that the final products have to be linked, only that the final product of one stage provide the raw material for the next higher productive stage. Suffice to say, that from one link, the raw material for the next higher productive stage is obtained, that is value is added to the product, and the situation outlined under the heading of divergent linkages is covered.

A final form of linkage might be termed 'ownership linkage' wherein an establishment undertakes the production, the wholesaling or the retailing of a particular company's products. This it might do under license or it might be directly owned by a parent company, but whichever it is, the policies, products and operation are closely controlled by the parent company.

What makes the development or existence of external economies so pertinent to the present study is that they may allow existing estab-

lishments to specialise and new establishments to enter the field to undertake those facets of the operation discarded by the already existing firm. For example, initially an establishment associated with the oil industry may produce, install and maintain line valves. Such an establishment is in fact engaged in both secondary and tertiary activities since it is engaged in both manufacturing and servicing its products. Eventually, the establishment may decide to simply manufacture the valves but leave the installation and maintenance to a different establishment which may come into existence as a wholly owned subsidiary of the original establishment or may operate under license. The older establishment is now engaged purely in secondary activity while the new firm is strictly engaged in tertiary activity.

Such an arrangement has implications to the present study, especially under the headings of external economies based on linkages and external economies based on labour.

Review of the Study Objectives

Chapter two briefly outlined some of the operations undertaken by the oil industry in its quest for oil and showed how various specialised establishments belonging to the tertiary sector of the industry worked in close liason with both the primary and secondary sectors. Also emphasised was the need for supplies of a wide and diverse nature to be available on a twenty-four basis, and the close integration and cooperation between all four categories as they are associated with the oil industry were shown to be necessary in order that huge financial losses were not to be incurred.

The present chapter has briefly reviewed some of the literature concerned with the theory of industrial location with dominant emphasis on the causes and effects of external economies and industrial agglomeration. Reviewing available literature indicates that the formation of external economies is more likely to occur in a closely integrated industry where common skills and close functional relationships are necessary in order that the industry function smoothly. These criteria are met by the oil industry.

The study at hand intends to discover if some, all, or any of the external economies have been or are at work in the secondary and tertiary sectors associated with the oil industry as it is located in Edmonton and to discover whether or not agglomeration of these sectors has occurred within the city. In an effort to achieve these ends, the following hypotheses have been formulated. These have been drawn together from available literature.

Working Hypotheses

The following study of the secondary and tertiary sectors of that portion of the oil industry located within Edmonton is based upon two main hypotheses. In formulating them, the basic assumption is made that establishments serving the oil industry have in fact concentrated in Edmonton. A defence of this assumption will be made in chapter four.

1. With regard to locational aspects, it is expected that the secondary and especially the tertiary sectors of the oil industry located in Edmonton are market orientated.

Since the market in this instance is dispersed, originally within a one hundred mile radius of the city (see chapter two) but which in recent years has vastly expanded in a northerly direction beyond provincial boundaries, and is not located at a single point, i.e. Edmonton, market orientation, in the present context, has two connotations.

The first is that Edmonton is the most convenient nodal point for the manufacturing of equipment and supplies and the dispersion of the same to the market. The second is that in the context of close functional relationships, industries, especially those of the secondary and tertiary sectors tend to locate close to their clients in order that contacts can be made and maintained at a face to face level. Berry [1967] states that, "Markets exist when a number of buyers and sellers communicate, and the price offered and paid by each is affected by the decisions of others. These market centres are the places to which consumers travel to complete the exchange process." In such a context, the gathering of establishments of the oil industry in Edmonton constitutes market orientation.

2. With regard to agglomeration, it is expected that those portions of the secondary and tertiary sectors of the oil industry which have concentrated in Edmonton have done so because of the advantages that have accrued to individual establishments by such concentration. Implicit in this hypothesis is the acknowledgement of the existence of external economies. This in turn leads directly to an extension of the second hypothesis and is designated 2a.

2a. It is expected that, the concentration of the secondary and tertiary establishments associated with the oil industry as it is

located within Edmonton has been both the result of and the cause for, the development of external economies. The presence of external economies has in turn allowed establishments to specialise in particular facets and thus contribute their specialties to the industry as a whole; further, the presence of these external economies permits the small independent company not only to form but to remain viable.

As stated in the introductory chapter, 'growth pole' planning is centred around the location of a 'growth industry', that is, one which will in turn attract other industries.

Edmonton's experience since the Leduc discovery of 1947 indicates that the oil industry is such a growth industry. As far as can be determined here, neither the oil industry in general, nor particularly that sector of it located within the city of Edmonton has been studied from the point of view outlined above. Thus knowledge of how or why the industry has grown in Edmonton is lacking and hence the present study was felt to be necessary.

In an effort to either substantiate or disprove the two working hypotheses, the following methods were undertaken.

Methodology

It was decided that to gain much of the information required, it would be necessary to visit establishments in person and to interview key personnel. The first requirement therefore was to decide upon the number of establishments to be visited.

A thirty percent sample was selected. It was felt that this sample would give a true representation of the population as a whole.

To ascertain which establishments should be visited, two reference sources were used. The first was Nickle's Oil Register, 1969-1970 edition,³ and the second was the Edmonton Public Telephone Directory, 1971 edition.

Interview Survey

In all, 109 establishments were visited.⁴ These were selected from a comprehensive list by means of a random sampling technique.

³Nickle's Oil Register is a private publication and contains within it information of establishments throughout Canada whose business purportedly includes over fifty percent with the oil industry. Use of the register has several disadvantages, one being that only those establishments providing information are listed and thus it is conceivable that some firms are missed. A second major disadvantage was that when a comprehensive list was initially drawn up, the 1971 edition of the register was unavailable and thus information contained in the only available source was dated.

For ease of presentation, Nickle's Oil Register divides the industry into twelve categories, these being as follows.

1. Oil and Gas Producers, Explorers and Developers.
2. Service and Supply Companies.
3. Consultants, Geological, Geophysical Engineering and Surveying and Data Processing.
4. Engineers, Designers, Construction and Fabricators.
5. Financial and Investment.
6. Geophysical Contractors and Exploration Drilling Contractors.
7. Lease Brokers and Land Agents.
8. Oilwell Drilling Contractors.
9. Oilwell Servicing.
10. Pipeline Companies and Power Distributors.
11. Refiners, Processors, Marketeers and Plant Operators.
12. Transportation and Oilfield Construction Companies.

For this study, categories (2) Service and Supply Companies, (9) Oilwell Servicing and (12) Transportation and Oilfield Construction were selected.

It was found that many establishments had multiple listings so that any establishment legitimately engaged in secondary or tertiary activities, such as pipelines, were included within the three categories outlined.

⁴The terms 'firms' and 'establishments' should not be confused. Fisher and Fisher [1954] define them as,

"An establishment is a person or group of persons occupying a recognisable place of business residence, government or assembly within a spatial unit. It is created when a unit of space is occupied and

Once the establishments to be visited had been chosen, a letter was forwarded to each of them outlining the study being undertaken and providing examples taken from the actual questionnaire of questions which were to be asked (See appendices 1 and 8). A phone call was made to each establishment in order that a convenient time and date could be arranged for the interview.

Prior to the personal interviews, a nine part questionnaire had been prepared in order that information gained from the interviews could be summarised. The questionnaire was designed specifically for the present study and was built around the working hypotheses. Each question was directed to at least one of these. (For full questionnaire, see appendix 2).

Each section of the questionnaire with the exception of section one which requested information of a general nature, for example question 3, How many years have you been in operation?, and section nine, consisting of a single summary question in which interviewees were requested to rank possible location factors, was directed at one or more of the causes of agglomeration as outlined above. Section four, for example, was directed at labour requirements and asked questions such as question 23, Do you have seasonal labour requirements? Section six was directed at transportation asking questions such as question 35,

dissolved when the spatial unit is abandoned. A business establishment should not be confused with a business firm, (which) is a business organisation composed of one or more different establishments."

[Fisher and Fisher, 1954]

For further discussion see, Rannels, J. 1956, The Core of the City New York, Columbia University Press.

How are the majority of your products/services moved to your customers?

Section eight was directed at linkages asking questions such as question 46, What form do most of your contacts take with your business associates?⁵

Rationale for Using a Questionnaire and Personal Interview Technique

As previously mentioned, studies dealing specifically with agglomeration and external economies as factors of location are not available so that in every respect it was felt that new ground was being broken. The formulation and design of the questionnaire was such that the answers could be easily summarised and coded. For this reason, the questions on the questionnaire were mostly of the directed response type, either dichotomous or multiple choice. One danger of such questions is that the interviewee may feel he has no room for personal viewpoints. Personal interviews allowed for a greater degree of flexibility than is apparent from the responses given and much additional information was gained beyond that requested directly.

The personal interview was used in preference to mailed questionnaires for several reasons, some of which include; the likelihood of a poor response from mailed questionnaires, mailed questionnaires are often filled out by secretarial staffs rather than persons at a

⁵A pretest was run during the week of June 29th, 1971 to July 2nd, 1971, when fifteen establishments, with at least two from each section, were visited. It was found that on the whole the questionnaire was quite satisfactory. It was least suitable for transportation and construction companies and it was felt that a shortened and probably modified questionnaire would have served the intended purpose.

On the average, the interviews lasted half an hour with extremes of eight minutes and ninety minutes reflecting in the former case time available, and in the latter, genuine interest in the project.

decision making level, misinterpretation or lack of understanding of questions are quickly overcome and at a personal interview the interviewee has more likelihood of feeling that he is contributing to the study.

Finally, because studies such as the present one are not available, the information required was also unavailable from any secondary sources.

Summary

Chapter three has set forth the objectives of the study and has summarised available literature on the subjects of external economies, agglomeration and linkages which are significant in terms of factors of location and industrial growth. Four external economies have been identified with special attention being given to external economies based on linkages. Linkages have been shown to take three main forms and have been categorised into four main types. From available literature a theoretical background has been drawn together. In light of the objectives and based on available theory two working hypotheses have been formulated.

Future chapters will establish whether or not significant concentrations of oil industry establishments have taken place in Edmonton and if so, will, on the basis of information gathered from the interviews try to ascertain the reasons for such concentrations with special attention being paid to external economies.

The final chapter of the study will be devoted to the conclusions arrived at with regard to the hypotheses formulated, available literature and information collected.

CHAPTER FOUR

AGGLOMERATION

With one exception¹, no empirical techniques have been discovered that have attempted to indicate the presence of agglomeration economies.

Reasons for this are many and varied, Marcus [1961] the author of the attempt, recognises the limitations of his technique and thus prepares his readers for the possible rejection of his proposals. Marcus in fact raises the question as to whether any technique could be

¹ An attempt to provide an empirical approach to agglomeration economies has been put forth by Matityaku Marcus [1961]. His technique was applied to the subject at hand but was abandoned for several reasons. In brief these are as follows;

1. Data Limitations: the technique is based on long term development. Data from the Canadian Bureau of Statistics is, however, not comparable between 1941-1951 or 1951-1961 since classifications are changed.

2. Exceptional local Circumstances: As one factor necessary for the technique, a growth rate of Edmonton was needed for the decades 1941-1951, and 1951-1961. These respectively were eighty-one and ninety per cent. Thus while the technique outlined arrived at proportionality factors (using population factors) of approximately 1, local factors were approximately 3 and 5. Because of this, even though within a ten year period a particular industrial classification group increased by as much as three hundred percent, agglomeration was not even considered as a possibility.

3. Personal Reasons: By utilising the growth of Edmonton as a 'market growth factor' it appears that the technique expects the goods and services to be marketed within the city. By subjective reasoning concerning the case in hand this does not appear logical, that is there are few oil drilling rigs operative within Edmonton city limits, but the city is certainly a supply and maintenance point for such rigs.

universal in its application. (See quote on page 35, chapter three.)

Other writers have questioned whether or not empirical techniques are possible. For example,

"These approaches to handling economies of scale and agglomeration are synthetic in nature. No deductive analytic system, based on the theory of the firm, has been developed to deal simultaneously with internal and external economies and their influence on locational patterns. The existence of mathematical nonconventies obviates the use of traditional marginal analysis. It is not clear that these problems will submit to analytic solutions even if more powerful tools were employed...Another factor which is hard to quantify and yet appears to be vitally important is agglomeration economies."

[Stevens and Brackett, 1967]

Since one cannot directly ascertain whether or not agglomeration has taken place, it becomes necessary to look at indirect approaches, which while not proving the point beyond all doubt, give strong indications.

Weber, in his original treatise defined an agglomerative factor as

"an advantage or cheapening of production or marketing which results from the fact that production is carried on to some considerable extent at one place."

[Friedrich Translation, 1929]

Using this statement as a starting point, it follows that if it can be shown that an activity or activities occur predominantly at one or a relatively few locations with respect to a given areal unit as a whole, then definitely concentration and possibly agglomeration has taken place.

Since the extraction of crude oil and gas is a raw material orientated primary industry (see introductory chapter for definitions) it is logical to assume that the industry locates at the source of

the raw materials and that the associated labour force will also concentrate either at or within easy access to these sources.

The predominance of Alberta in the production of both crude oil and natural gas is illustrated by table 4 - 1, while table 4 - 2 shows Alberta's dominance in the number of workers associated with oil mining.

Having ascertained that the oil and gas industry is centred in Alberta it is necessary to reduce the scale and ascertain where in Alberta it occurs, and if it is concentrated at any one or a few locations.

To achieve this, the fifteen federal census divisions of Alberta were used with the number of persons employed in the broad category, Mining, Quarrying and Oil Wells being used as an indicator of employment. Information in smaller areal units or in narrower categories is not available.

While this broad category includes all mining activities, it is nevertheless regarded as being useful in establishing oil centres. For example in a study of two oil centres in the United States the author writes,

"Unfortunately, not all oil field workers are classified as miners; oil tool salesmen and servicemen, lease brokers, seismologists, construction crews and truckers, geophysicists and oil company agents and managers are all essential parts of the industry but many of these workers are not included in the mining...Despite the difficulty attending classification, mining employment does emerge as the best indicator provided by the census."

[Weber, 1964]

Although Weber did his work in the United States, Canadian Census groupings were changed in the 1961 census to bring them more into line with the United States classifications. Since for the purposes

TABLE 4 - 1
OIL AND GAS PRODUCTION FOR CANADIAN PROVINCES AND TERRITORIES, 1961

	Oil Production (Barrels)	Per Cent of Total	Gas Production (m.c.f.)	Per Cent of Total
ALBERTA	157,811,712	68.005	500,843,900	76.379
SASKATCHEWAN	64,000,000	28.979	37,192,595	5.672
MANITOBA	3,971,144	1.789	-	-
ONTARIO	1,143,500	.518	14,544,165	2.218
BRITISH COLUMBIA	1,017,826	.461	103,018,988	15.710
NORTHWEST TERRITORIES	516,979	.234	41,678	.006
NEW BRUNSWICK	12,024	.005	96,318	.015

Source: Canada Year Book 1965

TABLE 4 - 2

WORKERS ENGAGED IN OIL AND GAS WELLS, GAS PLANTS AND BITUMINOUS SANDS DEVELOPMENTS AND WORKERS ENGAGED IN SERVICES INCIDENTAL TO MINING FOR CANADIAN PROVINCES AND TERRITORIES, 1961

	Employment Oil and Gas Wells etc.	Per Cent of National Total	Employment Services Incidental to Mining	Per Cent of National Total
ALBERTA	5658	71.232	9280	69.388
SASKATCHEWAN	730	9.190	1178	8.808
MANITOBA	44	.553	398	2.975
ONTARIO	532	6.697	1184	8.852
BRITISH COLUMBIA	970	12.212	1134	8.479
NORTHWEST TERRITORIES	2	.025	86	.643
NEW BRUNSWICK	7	.088	114	.852

Source; Canadian Dominion Bureau of Statistics, 1961

of this present study 1961 figures have been used predominantly, the quote is felt to be equally applicable to Canadian centres.

From the following table, Table 4 - 3, it can be seen that marked concentrations have occurred in division six and division eleven. Division six contains the city of Calgary while division eleven contains the city of Edmonton. Since the present study is concerned only with Edmonton, attention will be focused on division eleven.

Within Metropolitan Edmonton, employment figures in the classification Mining, Quarrying and Oil Wells is 2,839 this figure representing sixty-two percent of the total for the complete division. Thus it is concluded that a major concentration of the category occurs within the city limits.

A different way of showing that concentration has taken place and at the same time show that concentration in relation to other centres and thus demonstrate uniqueness, is to use location quotients. This is simply a ratio which compares the industry of a particular locale with that of the total areal unit and is found by using the formula;

$$\frac{\frac{e_i}{e_t}}{\frac{E_i}{E_t}}$$

where e_i represents the local employment in a particular subgroup of economic activity, e.g. oil wells, e_t represents the local employment in the major industrial grouping, e.g. Mining, Quarrying and Oilwells. E_i represents the national employment in the subgroup and E_t represents the national employment in the major group.

TABLE 4 - 3

NUMBER OF WORKERS ENGAGED IN MINING, QUARRYING AND
OIL WELLS BY FEDERAL CENSUS DIVISIONS. ALBERTA, 1961

Alberta Census Division	Employment Mining, Quarrying and Oil Wells	Per Centage of Alberta Total
1	107	.617
2	243	1.401
3	333	1.919
4	73	.421
5	567	3.268
6	7755	44.697
7	354	2.040
8	914	5.268
9	809	4.663
10	200	1.153
11	4500	25.937
12	106	.611
13	344	1.983
14	451	2.599
15	594	3.423
Totals	16350	100.000

Source: Canadian Dominion Bureau of Statistics, 1961.

The quotient is a measure of an area's or city's activity with respect to the nation's activity at a given point in time. If the coefficient has a value of 1.0 then the city or region is considered to be producing just sufficient to meet local needs. If the coefficient is above 1.0 then, all things being equal, the city or region is producing above its needs and is therefore presumed to be exporting.

It is interesting to note that by using this technique, Table 4 - 4 shows that the relative positions of Edmonton and Calgary change with respect to the classifications, Services Incidental to Mining, when compared to the percentage figures for the whole province.

The city of Edmonton is compared with nine other Canadian Metropolitan centres.

While such establishments engaged in directional drilling, well cementing and well completion are included within the category Services Incidental to Mining and are bona fide tertiary activities associated with the oil industry, other secondary and tertiary activities also associated with the oil industry are, for census purposes lumped together.² Examples would be found in the grouping Wholesale Trade wherein, Machinery N.E.S., Metal and Metal Products N.E.S. and Wholesale N.E.S., with N.E.S. meaning, Not Elsewhere Stipulated, include such activities as the selling of pipe. (See footnote).

²A concentrated effort was made to obtain figures from individual Industrial Classification Categories, both from the local Provincial Government Offices and from the Dominion Offices in Ottawa. Such information is apparently not available to the general public under a parliamentary act pertaining to privacy. The classifications chosen therefore are based on information received from the local statistics office as being those containing figures from the categories originally requested.

Table 4 - 4

Location Quotients for Selected Industries in Selected Centres

	Edmonton	Calgary	Montreal	London	Hamilton	Ottawa	Toronto	Vancouver	Windsor	Winnipeg
Employment in Oil and Gas Well	4.3	8.6								
Employment in Services Incidental to Mining	4.7	4.0	1.0	4.8	.422	.568	1.57	2.64	.008	1.56

Source; D.B.S. 1961

(the category services incidental to mining contains services provided to mining of all types, e.g. coal mining iron ore mining and nickel mining. Prior to 1961 although some mining of coal was taking place in Alberta its significance relative to the mining of oil was practically nil. This statement is made on the basis of personal contact with the Alberta Statistics Bureau. It is felt therefore that the figures obtained for both Calgary and Edmonton in this category, reflect the number of persons engaged in the oil industry. A different explanation would be required for the high quotient obtained for London)

Table 4 - 5

Location Quotients for Selected Activities in Selected Centres, 1961

	Edmonton	Calgary	Montreal	Hamilton	Ottawa	Quebec	Toronto	Vancouver	Windsor	Winnipeg
Miscellaneous Metal Fabricators	.46	.65	1.0	.37	.83	.37	1.5	.83	2.0	1.3
Miscellaneous Machinery Fabricators	.73	.70	.54	.73	.29	1.3	1.1	1.1	1.0	.7
Petroleum and Coal Products	5.3	5.4	1.5	.25	.08	.08	.67	1.6	.08	1.4
Industrial Chemicals	.10	.10	.28	.51	.15	.05	.20	.20	.15	.10
Other Chemicals	2.9	1.3	.65	.71	.60	.44	.82	.27	.54	.16
Other Construction	.95	.85	.42	.50	.34	.45	.91	1.07	1.30	.67
Special Construction	.94	.92	1.21	1.21	1.11	1.15	1.53	1.05	1.11	1.08
Trucks	1.35	1.12	.75	1.84	.96	.78	1.13	.76	.24	.70
Pipelines	4.44	3.63	--	.008	--	--	1.21	.80	--	.20
Machinery N.E.S.	2.28	2.22	1.48	.93	.92	1.00	1.36	1.88	.77	1.18
Metal and Metal Products N.E.S.	8.99	1.29	.21	--	.64	.21	2.35	2.57	1.28	.43
Wholesale N.E.S.	.95	.99	1.37	.73	.64	1.3	1.44	1.54	.59	1.60

Source: D.B.S., 1961

N.E.S. Not Elsewhere Stipulated

By using the categories in which secondary and tertiary activities associated with the oil industry are included, (See appendix 3) and the location technique outlined above, Table 4 - 5 illustrates that certain categories within Edmonton are well above the expected level. It is concluded that these high quotients are due to the presence of oil industry associated employment. As with Table 4 - 4, Edmonton is compared with nine other metropolitan areas in Canada.

Since the location quotients are based on employment, an indicator of concentration might be found in the growth of the number of establishments in the sectors in question. This is illustrated in Table 4 - 6.

TABLE 4 - 6

TABLE INDICATING THE GROWTH OF THE NUMBER OF ESTABLISHMENTS
ASSOCIATED WITH VARIOUS SECTORS OF THE OIL INDUSTRY
FOR EDMONTON, 1947 - 1970

	1947	1950- 1951	1954- 1955	1959- 1960	1964- 1965	1969- 1970
Oil and Gas Well Supply Equipment and Service	-	61	95	196	199	233
Oil Well Servicing	-	-	11	32	22	22
Pipeline Companies and Power Distributors	-	6	5	8	11	9
Oilwell Transportation and Oilfield Construction	-	-	-	-	49	68*

* Information unavailable prior to 1964 - 1965

Source: Zeiber, 1970

From 1947 to 1970 it can be seen that the number of establishments has increased 233 percent but this figure in terms of employment must be viewed with caution for, as will be shown in chapter five, many establishments are either self employed entrepreneurs or are employers of very few personnel and thus the total number of employees is not great.

A further measure utilising employment as an indicator of concentration is to try to ascertain the number of persons in basic employment, that is, the number of persons engaged in activities who act as gainers of revenue, the local requirements being met by non basic workers.

The method employed utilises the following formulation.

$$\frac{x}{\text{total local employment in major industrial group}} = \frac{\text{national employment in industrial subgroup}}{\text{national employment in major industrial group}}$$

Solving for x determines the number of persons who, theoretically, are needed in the industrial subgroup within the community to fulfil that community's own needs. This value is then compared with the actual number of persons employed. If the comparison reveals fewer persons are employed than are theoretically deemed necessary, then, that particular industry requires additional employment (and by implication additional production) to meet local needs. If more than the theoretical number are actually employed, the surplus workers are said to be basic employees, (and by implication overproduction is taking place with regard to local markets and thus exports are taking place).

While it is recognised that the technique is somewhat crude, the ratio of surplus workers to total workers indicates the degree to which 'over-production' occurs within the community. This according to

TABLE 4 - 7

TABLE SHOWING SURPLUS WORKERS FOR SELECTED INDUSTRIES
EDMONTON, 1961

Activity	Number of Surplus or Deficit Workers	Surplus Workers Expressed as a Per Centage of the Total Workers in that Activity
Petroleum and Gas Wells	447	77
Services Incidental to Mining	1595	95
Miscellaneous Metal Fabricators	-99	
Miscellaneous Machinery Fabricators	-95	
Petroleum and Coal Products	902	81
Industrial Chemicals	-303	
Other Chemicals	2517	99
Special Construction	-374	
Other Construction	-27	
Trucks	712	26
Pipelines	226	77
Wholesale Machinery N.E.S.	133	12
Wholesale Metal and Metal Products N.E.S.	1041	89
Wholesale N.E.S.	-63	

Source: Canadian Dominion Bureau of Statistics, 1961.

Nourse [1968] is a tangible evidence of the possible existence of agglomeration economies, for he writes, "Concentration of production in excess of market size may be caused by agglomeration economies."

Using the technique outlined, the 'basic worker' table, 4 - 7 was calculated. The table illustrates the degree to which over employment (within the context outlined) occurs in Edmonton within secondary and tertiary activities in which those associated with the oil industry are included.

Summary

Chapter four has, by several methods, shown conclusively that part of the oil industry per se and the secondary and tertiary sectors associated with that industry in particular, has concentrated within the city of Edmonton.

By intimation, it is tentatively suggested that on the basis of the evidence provided in chapter four, agglomeration economies are possibly at work. While the methods employed are recognised as being very indirect, they are employed in the absence of a more direct approach.

Having thus established that concentration of the sectors under consideration has occurred in Edmonton, the question arises as to why such concentration has taken place. An attempt at answering this question is made in the following chapters. Chapter five deals with markets.

CHAPTER FIVE

MARKET ORIENTATION AS A CAUSE FOR LOCATION

The Market

Because the location of oil is fixed by natural processes, the exploratory and productive phases of the oil industry are raw material orientated, that is, the industry is drawn to the fixed location.

To the manufacturer of supplies for the oil industry, however, and for the tertiary industries associated with it, the explorers and producers represent the market. The question thus arises as to where can secondary and tertiary activities locate in order that they can best serve the market.

As already pointed out (chapter three, page 42) the 'market' has two connotations with respect to the study at hand. There is first the areal extent over which products and services are sold and there is secondly the market created at a point, in this case Edmonton, by the gathering together of establishments in order that buyers and sellers can communicate using a convenient nodal point as a meeting place.

The Areal Market

Oil and gas are found in isolated locations and in varying quantities. When located, the size of the find is first determined with the resultant areal extent being termed an oil pool. The development of an oil pool results in an oil field. Map 2 - 2 and map 2 - 3

(pages 15, 16) indicate the locations of the major oil and gas finds within Alberta. In the last few years, other major finds have occurred in northern areas outside Alberta's boundaries with Prudhoe Bay (1969) and King Christian Island (1971) being two of the biggest.

The number and spacing of wells in the development of an oil field is strictly controlled by government regulations and is, under Canadian jurisdiction, customarily forty acres per well but which may be eighty or 160 acres per well depending upon the permeability of the bed rock.¹ (160 acres is one quarter of one square mile).

Because of the wide areal extent of the market and due to the variety and number of supplies required, it becomes impractical to service each field from a different centre since the duplication of inventory would greatly increase production and maintenance costs. In response to this impracticality, following the discovery of major oil and gas fields in Alberta and the North, three primary centres developed to supply and service them. These three centres were Calgary, Red Deer and Edmonton. During the later 1960's Red Deer lost much of its oil centre function² so that Calgary and Edmonton remain the centres of major importance.

¹In Alberta, exploration and oil field development is controlled by the Alberta Petroleum and Natural Gas Conservation Board. A similar board controls federal territories.

²This statement is made on the basis of personal contact with the Red Deer City Industrial Commissioner in March, 1971. During the late 1950's and early 1960's Red Deer contained over 200 oil establishments. This number in 1971 had reduced to between 90 and 100 many of which were simply phone answering operations for the purpose of taking orders which are filled from elsewhere. Of the more than 100 establishments no longer present in Red Deer, some have moved to Calgary, some to Edmonton and many which had been branch offices have simply been phased out of operation.

The Areal Market Serviced from Edmonton

The area served and serviced from Edmonton by establishments located within the city varies with two main criteria; the nature of the operation undertaken and the size of the establishment involved. Size is used in the sense of firm size rather than physical size of the individual establishments.

It was discovered on the basis of interviews, that multi-national and multi-plant establishments were assigned territories of various sizes by their head offices. The size of such territories ranged from all of Western Canada (west of the Ontario/Manitoba border) to a specific area within the province of Alberta.

The second group of establishments, in terms of market areas served, were the highly specialised service groups, such as, directional drilling, acidising, well cementing and oil field welding. In several instances of such specialisation the market served from Edmonton was primarily all of Western Canada but also global in extent, in that it was the knowledge and skills of the operator that was in demand and not (necessarily) the equipment that they used. (See appendix eight). Many of the skills and techniques developed had been gained in the fields surrounding Edmonton and were in demand throughout the world.

The third and final group of establishments were the smaller privately owned operations of a less skilled nature and primarily included establishments concerned with oilfield construction and maintenance, camp construction, oil field trucking and smaller supply companies. Their market area is resolved primarily on the basis of

competition between themselves. Amongst this group advertisements such as, "Will go anywhere at any time" [Nickle's Oil Register, 1970] reflect the competitive nature of their existence.³ Table 5 - 1 shows a break down of the establishments interviewed with respect to firm size. In the case of multi-national and multi-plant firms, regional head offices have been shown in order that the relative importance of Calgary and Edmonton as administrative centres can be gauged.

Edmonton as a Location Point

On the basis of the information presented in the previous section, the only common denominator between the three types of establishments with respect to location is the fact that oil was found in central and northern Alberta and the Northwest Territories which drew explorers and producers and these in turn drew manufacturing, service and supply companies to the area.

The impracticality of establishing major supply and service centres at each oil field has already been pointed out but the question still remains as to why Edmonton was chosen as a location point and not some other centre. Why did Edmonton become the point of focus? One of the main reasons can be found in the word, 'centrality'.

³This is not to suggest that competition does not exist amongst larger companies since as will be shown later, the industry as a whole is fiercely competitive. However, multi-establishment firms having larger resources in terms of finances and inventory are less likely to 'go under' than are the smaller ones. The mortality rate amongst oil firms is very high. Hanson [1957] writes, "The mortality rate of the oil industry is high and nearly 2,000 companies once active in Canada, mainly Alberta, are dead or dormant." By comparing the operational ages of the multi-establishment companies with those of single establishment companies one concludes that the greater percentage of the 2000 or more noted by Hanson are of the smaller variety.

TABLE 5 - 1

HEAD OFFICE AND BRANCH OFFICE LOCATIONS FOR ESTABLISHMENTS
CONTACTED DURING INTERVIEW SURVEY.. ..

a. Multi-national, Multi-plant Firms.

Head Office	Number	Canadian Regional Office	Calgary	Branch Offices Edmonton	Alberta
Houston, Texas	3	Edmonton	2		3
Los Angeles, California	1	Calgary		1	
Schreveport, Louisiana	1	Edmonton		1	1
Dallas, Texas	1	Calgary			
Great Bend, Kansas	1	Edmonton			
Chicago, Illinois	1	Edmonton			
Duncan, Oklahoma	1	Calgary		1	
Santa Fe Springs, California	1	Calgary		1	

b. National Multi-Plant Firms with Head Offices Outside Alberta.

Head Office	Number	Branch Offices			
		Calgary	Edmonton	Alberta	Canada
Toronto, Ontario	4	2	4	2	4
Montreal, Quebec	2	2	2	1	2
Burlington, Ontario	1		1		1

c. National Multi-Plant Firms with Head Offices in Edmonton or Calgary

Head Office		Branch Offices			
Edmonton	Calgary	Edmonton	Calgary	Rest of Alberta	Rest of Canada
9			6	9	9
	14	14		11	14

d. Provincial Multi-Plant Firms with Head Offices in Edmonton

Number	Branch Offices	
	Calgary	Rest of Alberta
22	12	13

e. Provincial Multi-Plant Firms with Head Offices in Calgary

Number	Branch Offices	
	Edmonton	Rest of Alberta
13	13	11

f. Single Establishment Firms based in Edmonton.

Number
34

Source: Field Survey 1971. Nickle's Oil Register 1970

Centrality in a geographic context does not necessarily mean spatially at the geometric centre of an area but simply central in terms of time-space, that is, it is the most readily accessible point from all other points within that area.

For example,

"Centrality is the essence of the point of focus. Consumers who must visit the market place on a regular basis want a location that permits them to conduct their business with a minimum of effort and if a choice of location is available will always prefer the one which involves the least effort."
[Berry, 1967]

also,

"Centrality refers to a state of high accessibility, the quality of being at the centre of a transportation system."
[Morrill, 1971]

With the discovery of oil in the area during the late 1940's and early 1950's particularly, Edmonton had initial advantages over any other urban centre in north central Alberta. It was the largest urban centre and provided amenities such as schools, a university and entertainment not available elsewhere. It also possessed the advantages of transport centrality; all major highways of north and central Alberta centred on the city, four railroads had depots here and the city was served by one commercial airport which has, since 1964, been supplemented by a second airport. Reference is made to maps 5 - 1, a, b, and c, illustrating Edmonton's nodality with respect to the three major transportation modes. While not initially the market itself, Edmonton in terms of time-space is proximate to all parts of the market.

With the attraction of oil industry establishments to the city, a secondary market developed within the city itself. As will be demonstrated in chapter seven, establishments buy and sell amongst

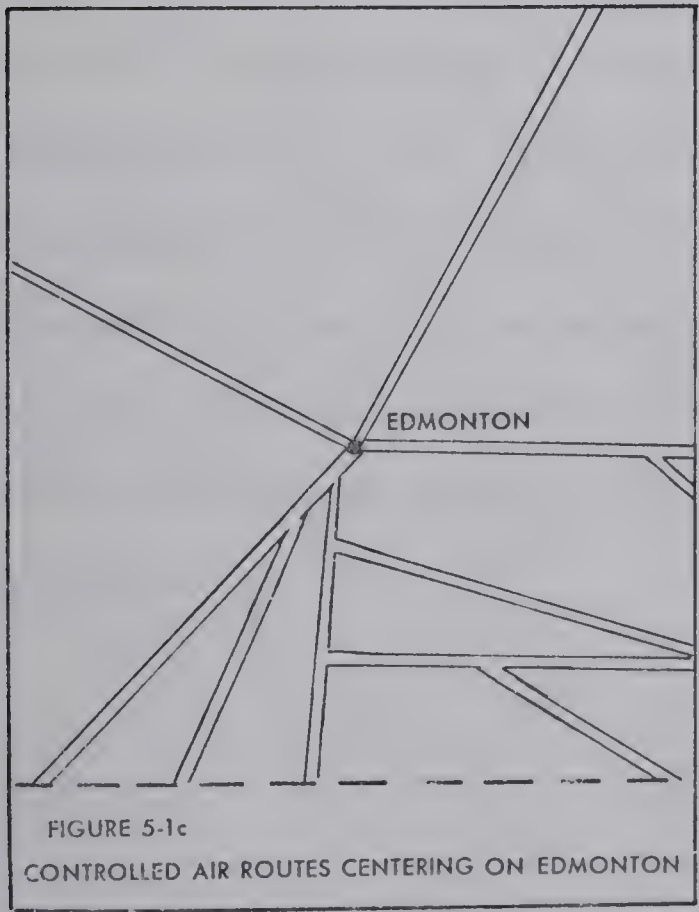
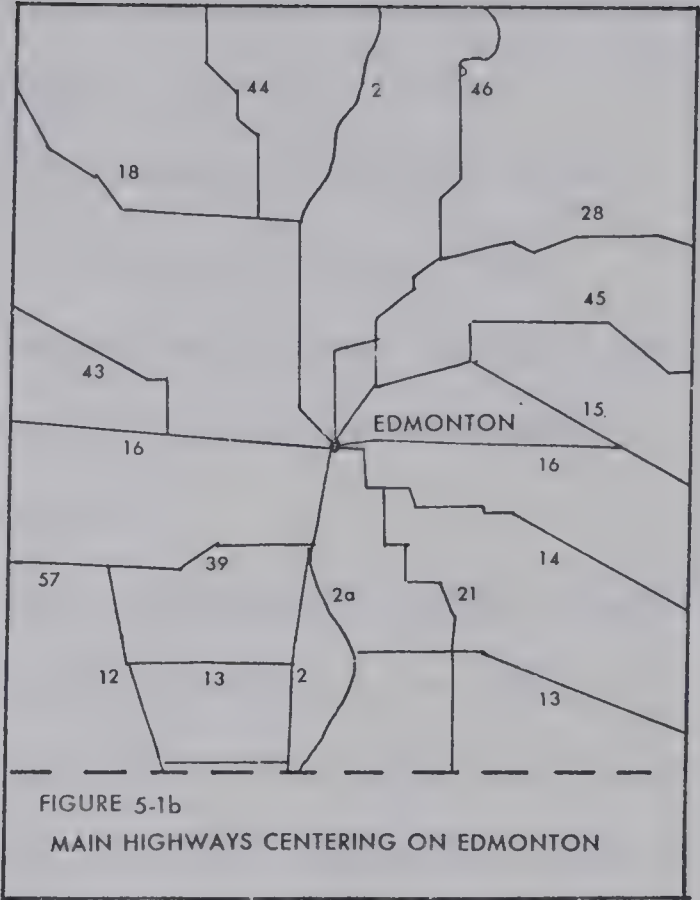
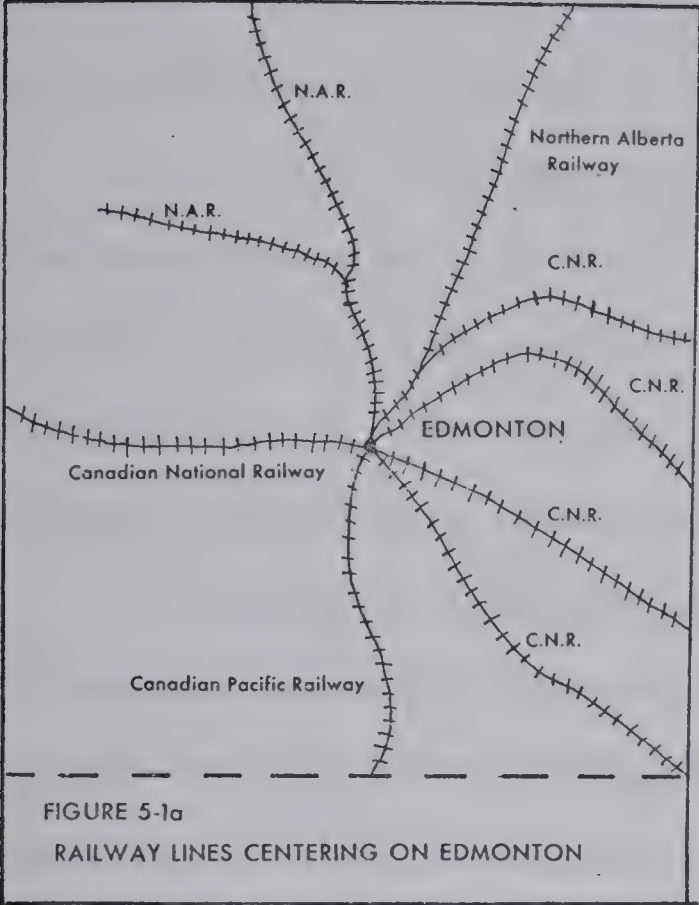
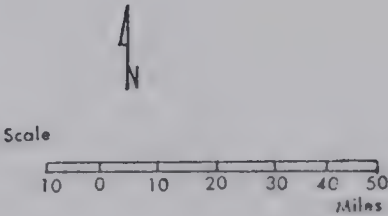


FIGURE 5-1 ILLUSTRATING EDMONTON'S
NODALITY WITH RESPECT TO THE THREE
MAJOR TRANSPORTATION MODES
OF ROAD,RAIL,AND AIR



themselves within the city and other firms have been attracted to the city to cater to this 'market at a point'.

It is this proximity to all of the market that has made Edmonton a choice location for the establishments visited. This statement is made on the basis of answers given to question eight on the questionnaire, "Once you had decided to open an establishment, what made you decide to locate in Edmonton?".

A total of ninety-two responses was gained from this question. Of these fifty-three (or fifty-eight percent) declared directly that proximity to market was the main reason. Of the remaining thirty-nine responses, twenty-one on the basis of discussions during the interview could be interpreted to be very heavily biased towards market interests, with replies such as, 'operations centre, oil capital, and supply centre' being so interpreted. This increases the percentages of answers to eighty percent in favour of market orientation as the major location factor. Other factors listed as primary reasons were, 'close to suppliers, (five percent), northern accessibility, (four percent), an established centre (one percent), and owner's home town (eight percent)'. The following table illustrates the degree to which establishments under consideration are by their own admission, market orientated.

TABLE 5 - 2

PRIMARY LOCATION FACTORS FOR ESTABLISHMENTS ASSOCIATED
WITH THE OIL INDUSTRY LOCATED IN EDMONTON

Reasons for Location in Edmonton	Number of Responses
Proximity to Markets	74
Owners Residence	8
Proximity to Suppliers	5
Northern Gateway	4
Edmonton, Established Centre	1

Source: Field Survey, 1971

Having ascertained that market orientation is the most important location factor for the establishments contacted, it becomes pertinent to further ascertain what types of establishments are particularly drawn to the markets. Are they primarily firms engaged in secondary activity, (that is manufacturing), in tertiary activities, (that is services and supply), or are both types of establishment equally attracted?

In order to acquire this information, each establishment was requested to state its primary function, that is, if more than one function was undertaken by the establishment, which of them was perceived by the owner or manager as being the most important. The results obtained are summarised in the following table.

TABLE 5 - 3

TABLE ILLUSTRATING THE PRIMARY FUNCTION OF OIL
ESTABLISHMENTS INTERVIEWED AS PERCEIVED BY THE
OWNER OR MANAGER

Code	Type of Enterprise	Number of Respondents
1	Manufacturing	15
2	Repair and Maintenance (Equipment)	9
3	Construction and Installation (Equipment)	6
4	Wholesale/Retail	44
5	Trucking	8
6	Well Service and Completion	16
7	Oilfield Construction	10
8	Catering Services	1

Source: Field Survey, 1971

The results are further illustrated by the following bar graph in which the absolute figures listed in Table 5 - 3 have been converted to percentages. The predominance of wholesale/retail operations is emphasised.

Working definitions with regards to the terms secondary and tertiary activities were presented in the introduction to this study. Utilising those definitions in terms of the results listed above, it becomes apparent that only fifteen of the 109 establishments interviewed (fourteen percent) are primarily engaged in secondary activities.

Figure 5 - 2

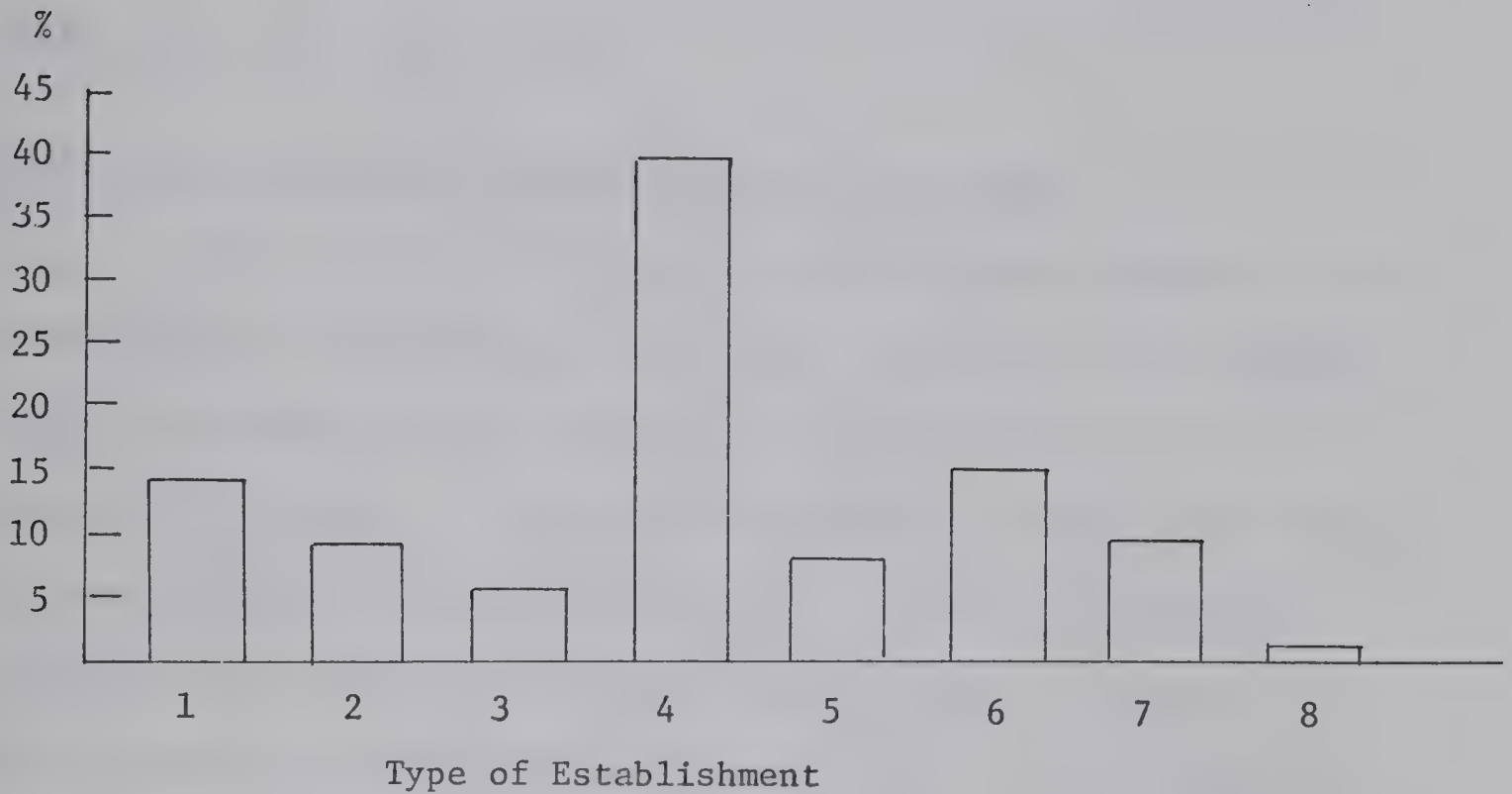


Figure 5 - 2 illustrating the number of establishments interviewed classified according to their primary function.

1. Manufacturing
2. Repair and Maintenance (Equipment)
3. Construction and Installation (Equipment)
4. Wholesale/Retail
5. Transportation
6. Well Service and Completion
7. Oilfield Construction
8. Catering

The remaining ninety-four are engaged in service and supply activities and are thus classified as being tertiary in nature.

The results of the questionnaire survey with respect to the locational aspects for the establishments under consideration thus corresponds very strongly to the first study hypothesis set forth in chapter three, that is, secondary and especially tertiary industry tends to be market orientated.

Market Areas Served by the Establishments Interviewed

As has already been demonstrated, the establishments interviewed perceive themselves as being market orientated. The spatial extent of the market served however, is located mostly outside of Edmonton city limits. A cartogram was presented to each establishment and they were requested to list, one, two and three in order of importance where their major market areas occurred. The results of these answers are illustrated in figure 5 - 3. A weighted table on the basis of three, two and one for a first, second and third order ranking is also provided in order that the over all market scene becomes easily identifiable due to exaggeration.

Figure 5 - 3

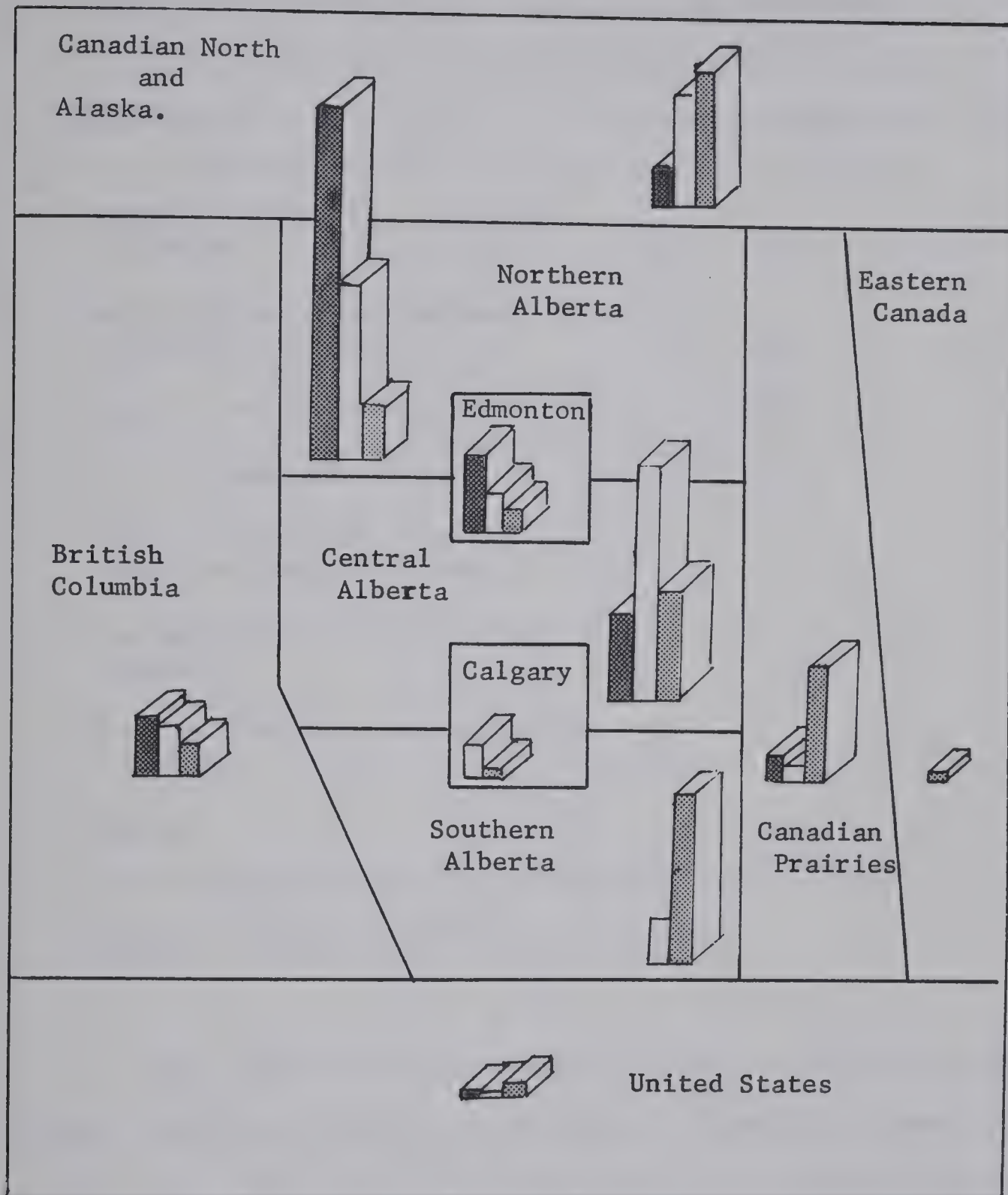


Figure 5 - 3 illustrating the first, second and third most important market areas served by establishments located within Edmonton as ranked by the owner or manager.

TABLE 5 - 4

MARKET AREAS SERVED BY THE ESTABLISHMENTS INTERVIEWED

Market Area	Weighted Response
Northern Alberta i.e. North of Edmonton	196
Central Alberta i.e. Between Edmonton and Calgary	112
Canadian and United States North	65
City of Edmonton	50
Western Canada i.e. West of Manitoba/Ontario Boundary	41
Southern Alberta i.e. South of Calgary	33
Canadian Prairies i.e. Excluding Alberta	31
Alberta	24

Source: Field Data, 1971

From the interviews, it quickly became apparent that one of the most important words in serving the oil industry is 'speed' (see appendix four). If a line blows, (begins to seep oil) then it is imperative that it be repaired immediately if huge losses are not to be incurred. If a well goes out of control or is in danger of doing so, again it becomes imperative that it be treated immediately. Since appropriate parts and personnel cannot be present at all locations, a central location to all becomes the most logical place to locate.

Edmonton's historical advantages (see chapter two) making it the nodal point for central and northern Alberta plus the historical accident that makes it the most northerly nodal point of large size, not only in Alberta, but in Canada, both served to attract the establishments under consideration.

It has already been established that Red Deer was an alternative location for establishments in Alberta and there are other locations in the province (notably Lloydminster and Lethbridge) where oil establishments have located. For the establishments under consideration, however, Edmonton possessed perceived advantages that made other locations seem less desirable. Just how strong this attraction is compared to other places can be gauged from the responses to the question, "What other possible locations were considered?"

Only thirty-three of the establishments interviewed even considered locations outside of the city. Of these, twenty-five considered Calgary (the only other major nodal point in the province), two considered Red Deer, and six considered other locations with Zama Lake, Drayton Valley and Red Water being mentioned specifically. Of the twenty-five who listed Calgary as an alternative, eleven noted, in response to a further question, that they are subsidiaries of a plant located in Calgary or themselves have subsidiary establishments within that centre.

Reasons for Locating in Edmonton

While the accessibility of Edmonton to all parts of the major market area appears to have been the basis of most of the locational choices to locate here, the choice also appears to have been made

largely from a 'common sense' or a 'perceived advantage' point of view on the part of the decision maker rather than a real knowledge of any advantages which may or may not be present within the city. Accessibility also appears to have been the over riding point. These statements are made on the basis that of ninety-five replies, eighty-nine establishments stated that no organisation of any kind had been contacted with respect to initial location. It would appear therefore, that a decision was made to locate in Edmonton by the entrepreneur and once this decision had been made, other factors such as where in Edmonton and whether space and utilities were available were then broached.

The conclusion reached from such findings is that, inherently, Edmonton possesses no readily apparent features that are essential to the operation of the establishments under consideration and they could quite possibly have located elsewhere with respect to other requirements except that of accessibility. A defence of this conclusion will be made in chapter six regarding external economies.

Despite lack of contact with the local planning authorities and public utilities, ninety-nine percent of the responding interviewees (104) perceived their original decision to locate in Edmonton as being the correct one, for they each stated that if they had the locational decision to make again under present circumstances, they would still locate within the city.

Length of Occupance within Edmonton

Because the operational age of the establishments visited could prove useful in trying to establish the existence or lack of external economies, their development or their demise, this information was

Figure 5 -4

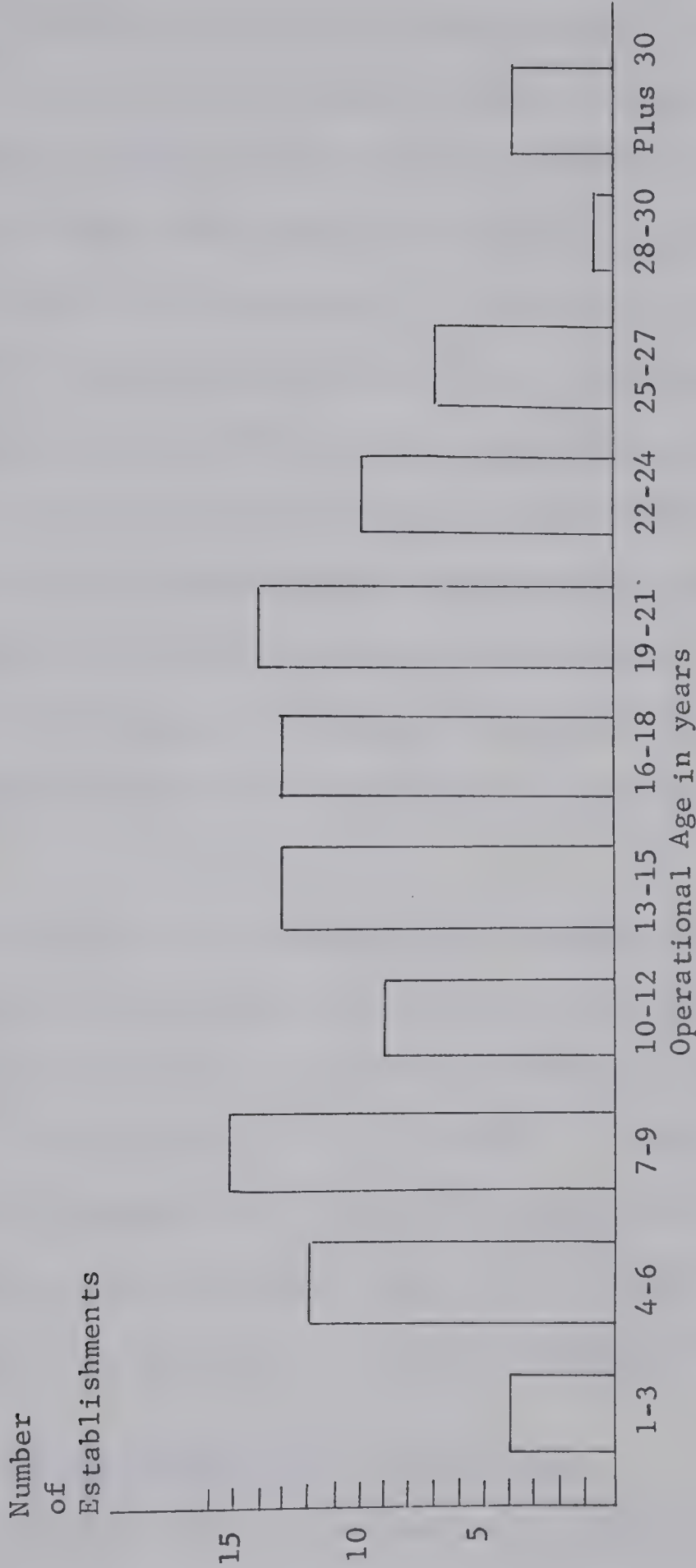


Figure 5 -4 illustrating the operational age of the establishments interviewed.

requested from the establishments interviewed. The median age of the establishments visited was found to be seventeen years. The results of this question are shown on the following histogram, figure 5 - 3.

Of the establishments interviewed only twelve percent listed themselves as being twenty-four years of operational age or older. This age is particularly relevant since it is twenty-four years since the Leduc oil strike occurred and thus the twelve establishments making up the twelve percent are part of either the original or what remains of the original core of oil establishments. Included within this core are five wholesale/retail establishments, three manufacturing, one trucking, two construction and one catering establishment. Only three of this number listed themselves as being of pre-Leduc vintage, two of these being manufacturing establishments and one being a catering establishment.

Following Thompson's hypothesis [1966] concerning the development of functional linkages, it can be seen that any linkages and/or external economies which are present have developed since the Leduc discovery. An implication of this statement is to further reinforce the market orientation of the establishments in question. It was not until the markets developed within the immediate vicinity that the oil industry establishments located within Edmonton.

Mode of Operation of the Establishments Interviewed

In each and every case, regardless of the type of operation undertaken by the establishment visited, the most important 'tool' used by the establishment appeared to be the telephone. Few interviews were

completed without the interviewee being interrupted at least once by a phone call. In some of the bigger firms (multi-plant establishments) the telex machine was also much in evidence. Following the receipt of a call or message, either orders were transmitted to another member of staff to fulfil, or a call was made to a different establishment elsewhere.

In all cases of the service industries, work is done under contract with specific needs being met and then the association between the two parties being terminated until further needs arise. Supply companies fill orders as required. None of the establishments visited initiate any undertakings themselves but receive orders, instructions or requests from elsewhere and then fill them.

Because of the need to gain and maintain customers, accessibility to them again becomes a prime requisite for the establishment in terms of location. Chapter seven will demonstrate the degree to which personal contacts are considered important and while the results of the transactions carried out by the contracting parties may not be apparent within the city limits, that is the sale or service occurred elsewhere within the market area, the contacts made at the 'market at a point' made the sale possible. Thus the term 'market orientation' for the establishments under consideration takes on added meaning.

Summary

Chapter five has demonstrated that on the basis of responses gained from interviews, the secondary and especially the tertiary sectors of the oil industry as located within Edmonton are over-

whelmingly market orientated, this regardless of the particular segment of the industrial sectors in which each individual establishment is engaged. The chapter has also shown that it is Edmonton's central location with respect to the market rather than any factors found in Edmonton itself that make the city attractive as a location point. This statement must, however, be qualified, in that the drawing of oil establishments to the city has created within it a market at a point and while the evidence of sales is not necessarily evident within the city, the actual transactions took place here.

Spatially, the major markets have been shown to be in the areas immediately surrounding the city and to a lesser extent within Edmonton itself.

Chapter six will demonstrate the existence or lack of, external economies with the exception of linkages, which will be the subject of chapter seven.

CHAPTER SIX

EXTERNAL ECONOMIES

As mentioned in chapter four, all but three of the establishments visited are of post Leduc age. A considerable number of them have entered the field within the last ten years and half of them are less than seventeen years of operational age. From this information, it becomes apparent that if there are any external economies present within the sectors of the oil industry under consideration, they have developed within the last one and a half decades since they were certainly not present before. The questions raised, therefore, are; one, have any external economies developed within the sectors under consideration, and if so, two, are they peculiar to the oil industry alone or are they beneficial to other industries? In other words, have urbanisation economies as well as specialised external economies developed? External economies will be handled under the headings utilised in chapter three.

External Economies based on Labour Supplies

In trying to ascertain if such external economies exist, several pertinent questions arise. Two of these are; one, are the establishments under consideration labour intensive in their requirements, and, two, what types of labour are required with respect to skills? Interviewees were asked these questions and a breakdown of their replies is shown in Table 6 - 1.

Table 6 - 1

Table obtained from the results of questionnaire based on questions applicable to Labour Requirements and Characteristics

	Maximum Possible Response										Permanent Employees		Seasonal Requirements				Seasons Required		Labour Turnover		Labour Types		Labour Availability		Labour Training		
	1 - 5	5 - 10	10 - 15	15 - 20	Plus 20	Yes	No	Spring	Summer	Fall	Winter	Varies	Large	Stable	Skilled	Un-Skilled	Mixed	Always	Usually	Skilled	Un-Skilled	Hard	All Hard	Always	Usually	Sometimes	Never
Manufacturing	15	1	3	4	3	4	8	7	-	3	-	1	4	4	11	2	5	8	2	5	8	-	-	5	5	5	-
Repair and Maintenance (Equipment)	9	3	2	1	-	3	2	7	-	-	-	1	1	1	8	1	2	6	1	2	6	-	-	4	2	2	-
Construction and Installation (Equipment)	6	2	1	-	1	2	5	1	-	1	-	2	2	1	5	5	-	1	-	3	3	-	-	2	4	-	-
Wholesale/Retail	44	10	11	7	4	12	5	39	-	1	-	2	2	5	39	18	8	16	1	29	8	-	2	14	15	9	1
Transportation	8	-	2	1	1	3	4	4	-	2	-	-	2	2	6	6	1	1	1	4	3	-	-	1	4	1	2
Well Service and Completion	16	1	8	1	1	5	10	5	-	-	1	3	6	7	9	8	1	7	2	7	3	-	4	4	8	3	1
Oil Field Construction	10	1	1	-	2	6	9	1	-	1	-	4	4	7	3	3	-	7	1	8	1	-	-	-	5	4	1
Catering	1	-	-	-	-	1	1	-	-	-	-	1	-	-	1	-	-	1	-	1	-	-	-	-	1	-	-

Source: Field Data, 1971

Figure 6 - 1

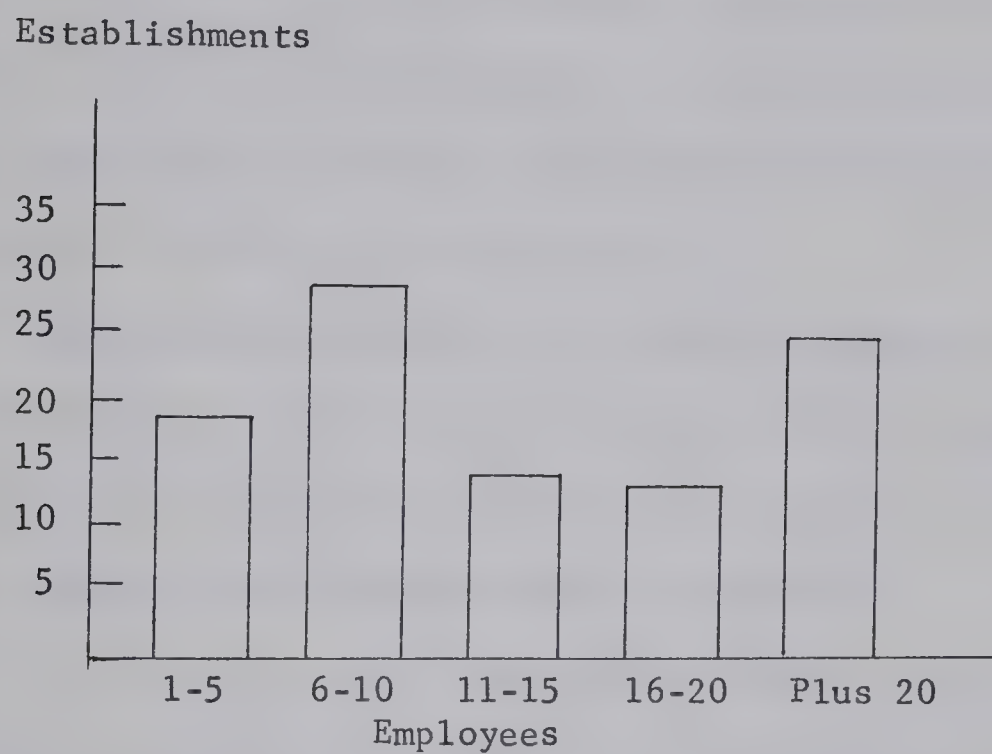


Figure 6-1 illustrating the number of permanent employees engaged by the establishments interviewed.

In replying to labour requirements in terms of numbers, it was found that forty-six (forty-three percent) of the establishments interviewed had ten or fewer employees and seventy-three (eighty percent) had fewer than twenty-one. Figure 6 - 1 illustrates labour needs. If employment figures obtained from the interviews are projected to include all the establishments contained within the secondary and tertiary sectors of the industry as located with Metropolitan Edmonton, approximately 4,000 to 4,500 persons are directly employed in serving and servicing the oil industry.

With respect to skilled and unskilled labour, two patterns emerged being diametrically opposite along the skill spectrum. Either the labour had to be extremely skilled, (see appendix six) or relatively unskilled. Most firms required some of each type.

The polarity of the labour requirements in the oil industry posed certain contradictions within the accepted framework of labour economies. Where special skills exist within the oil industry it becomes very apparent that the holders of these skills become very well known, and it is the person and not the company who is requested to fulfil specific needs. In the establishment of a new firm, dependent upon special skills, a sequence of events appears which tends to the following pattern: Person x joins company Y where he becomes extremely proficient and is sought after by other companies requiring his skill. Having 'made his mark' so to speak, he branches off from company Y and starts his own company Z. His reputation follows him and thus his market and his entry into the field is assured.

It was discovered, as a broad generalisation, that the more specialised the establishment visited, the smaller the labour requirements tended to be, that is, most of this category appeared in the 1 - 5 employee range and that the manager of the company was self employed. Thus Nickle's Oil Register contains many entries such as:

For company XYZ

Directors:- Dale M. Simmons
E. Joan Simmons
H. Gordon Pierce
K. W. Crowshaw

Officers:- Dale M. Simmons (President)
E. Joan Simmons (Secretary)

Key Personnel:- Dale M. Simmons (President)
K. W. Crowshaw (General Manager)

Source: Nickle's Oil Register, 1970

Many companies found in the register also list key personnel by name in order that contacts can be made and hopefully maintained. Since all work is done under a contract basis, it becomes very important that the present and potential customers are kept fully aware of any changes that might occur within the establishments with which they deal.

Most of the establishments interviewed had a mixed labour force with respect to skills and this applied especially to the whole-sale/retail establishments and field construction establishments. Of the establishments questioned, eighty percent suggested that they have a very stable labour force with little labour turn over. Turn over of labour is relatively high among the less skilled personnel and also among the secretarial staffs who are predominately female.

Seasonal requirements are only applicable to forty percent of the establishments visited and these are predominately firms engaged in field construction and field maintenance.

Labour Availability

Only six of the one hundred and five respondents to the question concerning labour availability complained that all labour was hard to obtain, although thirty-two felt that skilled labour was hard to obtain.

Skilled and Unskilled Labour

The terms skilled and unskilled were envisaged by the interviewer being those applied by trade unions to the particular jobs undertaken. However, it was discovered that organised labour was not a factor in the secondary and tertiary sectors of the oil industry located in Edmonton. The terms, therefore, were left to each individual interviewee's interpretation and are thus subject to considerable variation. Since no statistical tests were applied to the results, this variation was thought to be more of an asset than a liability for undoubtedly the entrepreneur's definition of skilled labour would be more stringent than that of labour organisations. However, the entrepreneur's definitions make the responses concerning skilled labour open for discussion especially in light of the comments already made with respect to certain special skills. To acquire these skills, a considerable amount of apprenticeship is necessary and once established, except where the desire to form an independent company arises, skilled personnel appear to be very stable with respect to

job mobility. Thus, when an establishment wishes to expand in very skilled areas, certain labour requirements are unavailable. Apart from this one exception, labour availability was not a concern to the establishments interviewed.

With regard to labour training, a considerable degree of interpretation is necessary of the face value results obtained from the questionnaire. At face value, thirty percent of the responding establishments indicated that all labour has to be trained, forty-four percent usually has to train labour, twenty-four percent sometimes has to train and only five percent indicated that a fully trained labour force is available.

A question regarding the amount of training that the employing establishment was required to give, was omitted from the questionnaire, so information was solicited from interviewees in further discussions. It would be fairly safe to assume that all labour entering all establishments in all industries requires some degree of training and that a transfer from one establishment to another requires a certain adjustment with regard to procedures, products, prices and policies. The basic skills, however, are transferable from one establishment to another. Hence, in the present situation, moving from one wholesale/retail establishment to another requires the gaining of knowledge of the contents and procedures of the new firm. The knowledge of oil field equipment parts and the skill of using a catalogue, however, are transferable. While the gaining of knowledge of the new procedures is properly termed 'training', the hiring establishment is not required to initiate training from the beginning.

In the majority of cases where this point was raised during the interview, the degree of training required to be done by the hiring firm was acknowledged to be of the minimal type except in those cases where apprentices were trained. It was concluded from the interviews that there exists within Edmonton a pool of labour which is at least trained in the basic requirements of most of the establishments likely to need their services. Some additional training of specific detail is given by the hiring establishments, but they are not required to initiate training.

Seasonal Requirements

Although only forty-three responses were obtained from the question pertaining to labour requirements, thirty percent of these listed winter as their time of greatest need for seasonal labour with fifty percent listing various times but with a marked and increasing bias towards the winter season. Maps 2 - 2 and 2 - 3, pages 15 and 16 illustrated the northward trend of oil findings. During the boom years of the late 1950's and early 1960's most of the seasonal labour requirements occurred in the summer as the Pembina and Redwater fields were developed. Since that time exploration and discoveries are taking place predominately within the permafrost zone where conditions during spring and summer make northern exploration almost impossible, leaving fall and winter as the only alternatives. Even if technology did create vehicles to make travel during the summer season more viable, public and governmental pressures to protect the environment make a return to these seasons as periods of maximum activity rather remote.

Conclusions Regarding External Economies with Respect to Labour Requirements

On the basis of statements noted during the interviews and the responses given to the questions, it was felt that there is, within Metropolitan Edmonton, a pool of labour already skilled in most facets of that part of the oil industry under consideration and that external economies are at work in this particular instance, making it easier for an entrepreneur to enter the field now than it was at the beginning of the oil era. It was not apparent from the interviews whether labour availability was perceived as being a locational advantage to the establishments interviewed. In response to a further question, wherein interviewees were asked to rank possible location factors, labour availability was ranked exactly halfway down the scale. From this result and the others outlined above, it was concluded that whether perceived or not by the entrepreneurs, labour availability was not regarded as a dominant factor when initial location decisions were made. It is therefore concluded that external economies based on labour are, in fact, present but are not necessarily perceived, or if perceived are not considered overly important by the establishments interviewed.

External Economies Based on Transfer Costs

Before dealing with specifics of questions asked and responses given, attention is again drawn to Table 4 - 5, page 57, wherein location quotients for selected centres are given. It is pertinent to note at this juncture that from the table it can be seen that Edmonton is second only to Hamilton (in the centres listed) with regard to trucking

activities, that is, Edmonton exceeds its own trucking requirements to a considerable extent. It has also been noted several times that Edmonton is served by four railways, two airports and is the focal point of an extensive road network, and also that Edmonton's accessibility provides advantages not enjoyed by other centres. From these three points, it would appear that the physical components necessary to aid the development of external economies based on transfer costs are present within the city. Whether or not, utilisation of these features has occurred with respect to the oil industry was the subject of enquiry for questions thirty-four to thirty-eight inclusive, on the questionnaire. A breakdown of the answers received is tabulated in Table 6 - 2.

To make the results meaningful, those establishments listing transportation as their primary function were eliminated from all calculations. Results of the questions regarding the movement of supplies to the establishments under consideration and the movement of supplies and services from the establishments and their mode of transport, are illustrated on the following graphs Figure 6 - 2. The graphs were constructed on the basis of the number of answers given and were drawn proportionately with respect to area with the smallest graph being designated as one. Thus in the case of incoming supplies, the piegraph, indicating major mode of transportation, has an area nine times that of the graph indicating the fourth transportation mode in terms of importance to the establishments visited. Thus, nine times as many interviewees gave an answer as to the main mode of transportation for incoming supplies as gave an answer with respect to the fourth mode of

Table 6 - \$
Table obtained from results of the questionnaire based on questions pertaining to transportation

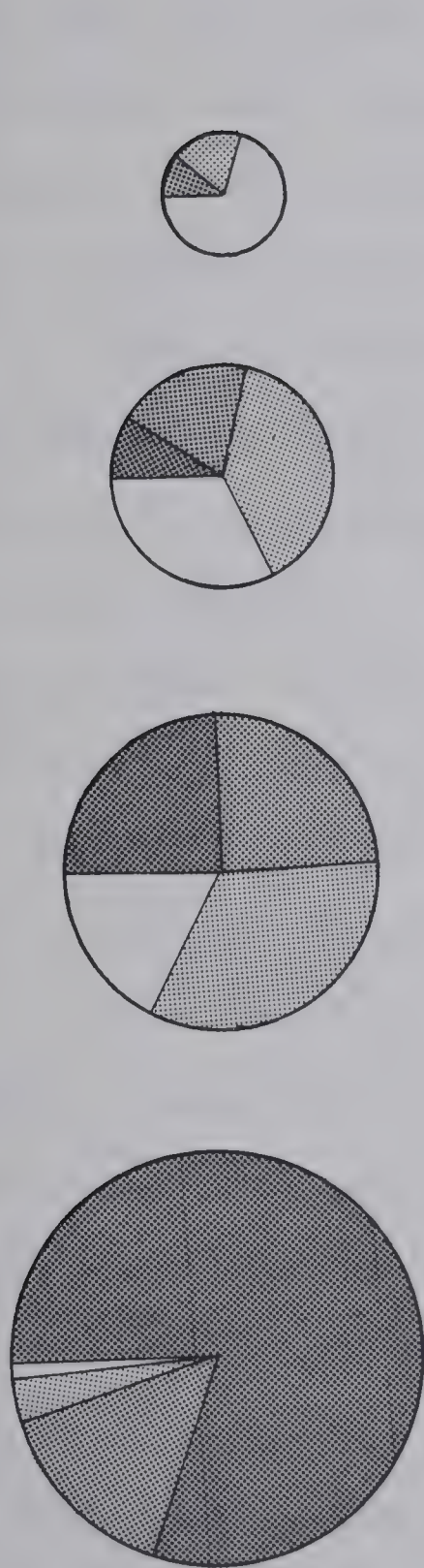
	--- In-Coming Supplies ---												--- Out-Going Supplies and Services ---												Operate Without Common Carriers				Effect of Closing Industrial Airport												
	Most Important			Second Most Important			Third Most Important			Least Important			Most Important			Second Most Important			Third Most Important			Least Important			Yes		No		Yes, but Disadvantage		No		Yes		No		Drastic Marginal		No effect		
	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Company Vehicles	Common Carrier	Air	Yes	No	Yes	No	Yes, but Disadvantage	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	
Manufacturing	15	4	1	3	2	4	3	-	3	2	-	3	4	1	-	3	2	3	3	-	3	3	-	3	3	-	1	2	7	6	2	7	6	9	3	6	6	3	6	6	
Repair and Maintenance (Equipment)	9	2	6	-	3	-	1	-	2	1	2	-	6	3	-	-	1	2	-	-	1	2	-	-	1	2	-	-	2	7	-	4	5	-	4	5	-	6	3	3	
Construction and Installation (Equipment)	6	-	4	1	-	2	1	4	-	-	-	-	3	2	-	-	2	2	-	1	-	2	-	-	-	-	-	1	2	2	2	4	1	4	1	4	1	1	4	1	
Wholesale/Retail	44	2	4	1	-	10	3	14	6	4	1	6	7	1	-	2	11	29	-	10	6	6	4	2	1	5	9	1	-	2	3	5	3	1	8	2	8	1	1	1	
Transportation	8	2	4	1	1	1	1	-	-	1	-	-	6	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4	3	5	1	1	6	1	1	6	6		
Well Service and Completion	16	4	8	2	-	3	4	1	1	2	-	2	1	-	-	-	14	1	-	1	3	-	-	-	-	-	-	-	4	12	-	4	12	1	8	7	4	12	1	8	7
Oilfield Construction	10	3	6	-	-	4	3	1	-	1	-	1	-	8	1	-	1	1	-	1	1	-	1	-	-	-	-	3	7	-	3	7	1	2	7	1	2	7	7		
Catering	1	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	

Source: Field Data, 1971

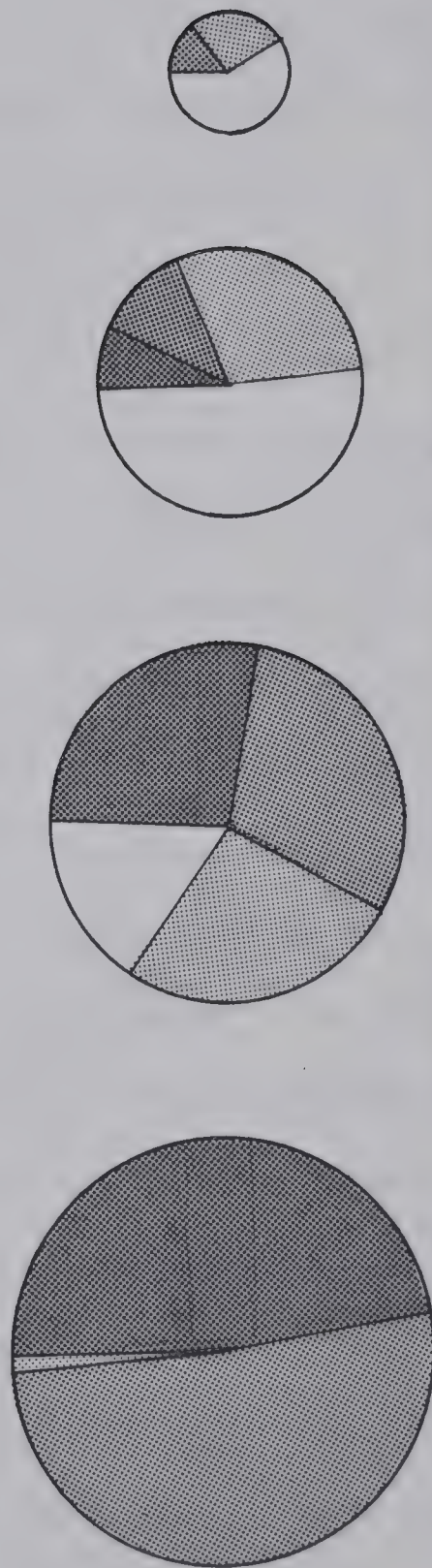
Source: Field Data, 1971

Figure 6 - 2

Most Important Second Most Important Third Most Important Least Important

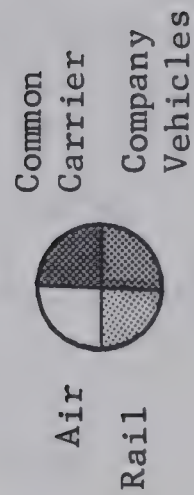


In-coming Supplies; Modes of Transportation



Out-going Supplies and Services; Modes of Transportation

Figure 6 - 2 illustrating the methods of transporting incoming supplies and out-going supplies and services, ranked in order of importance as perceived by the owners or managers of establishments interviewed.



transportation. Having established the number of replies and drawn proportionate graphs, each graph was divided on a percentage basis.

As an average figure, seventy-one percent of all incoming supplies to those sectors of Edmonton's oil industry under consideration arrive via private, common carrier, road transport, with a further twelve percent using company transport, also road; eleven percent arrives by rail while only four percent arrives by air. The dominance of road transportation is thus very apparent.

Road transportation has two major advantages over its competitors in the hauling business. Firstly, truck transportation is not subject to rigid scheduling as are rail and air transport. This is especially important to the secondary and tertiary sectors of the oil industry in that, since all work is done on a contractual basis, inventories are not depleted on a regular time schedule and needs vary over time. However, when needs do occur they require immediate fulfilment and except in emergency cases where air transportation is utilised, these needs can best be met by truck transportation. The second major advantage of truck transportation in the present instance is its adaptability with respect to pick up and delivery points. It has already been established that little manufacturing of oil field equipment occurs in Edmonton. Most oil field equipment, not only for Canadian fields but also for world fields, is manufactured in the United States. Much of it comes from the state of Texas with Houston and Dallas being

two of the larger manufacturing centres.¹ Trucks are adaptable in that they are able to load less than car load lots from several locations and deliver same to various locations. The one complication that arises in the present instance is the barrier formed by the international boundary which necessitated custom inspection before delivery can take place.

The dominance of road transportation is carried over when discussing delivery of goods and/or services with a total of ninety-eight percent being moved by road transportation with approximately fifty-three percent being moved by company vehicles and forty-five percent being moved by private, common carrier, companies.

Such is the importance of the private sector of the transport network that only nineteen percent of the establishments interviewed declared that their operations would be unaffected should the common carrier transportation cease to function. A total of twenty percent declared that they would be unable to operate at all without it. The remaining sixty percent declared that they would be able to operate but at a considerable disadvantage. It is suspected that many of the firms declaring that they would be able to operate but at a disadvantage did

¹Information regarding manufacturing centres was obtained from the interviews and from noting advertisements in trade magazines such as 'Oilweek'. Just as Edmonton had initial advantages over other locations in the Canadian west, the fact that the world's first major oil discoveries were made in Texas and other Gulf States appears to have given that area initial advantages for manufacturing concerns. The secondary manufacturing centre in the United States is the Los Angeles area while Japan and Italy are becoming increasingly important for the manufacture of equipment, especially pipe.

so from an optimistic point of view and that many of them in fact would be unable to operate.

Many of the supplies incoming to Edmonton arrive via general haulage carriers and not specifically by oil industry carriers. This is because, as explained above, many of the shipments are in less than truck load lots. Oil industry carriers are, on the whole, very specialised and utilise specialised and sophisticated machinery. Rigs capable of carrying a drilling rig can, for example, cost anywhere in excess of \$250,000 being built specifically for the specific purpose. This figure which appears astronomically high was double checked at several locations.

Deliveries are almost always made in less than truck load lots and much of it is done in company cars rather than trucks. Another type of vehicle which appears to have widespread use is the public bus service company, such as the Greyhound Line. Although a fully rigged oil derrick contains upwards of two hundred tons of structural steel, most of the replacement parts are quite small, such as, chain links, gaskets and even nuts and bolts. (One establishment visited for example, part of a much larger organisation, was concerned entirely with the manufacture of injection systems, each of which would fit into the average sized shoe box). The advantage of the bus service is that while it is a scheduled service, it stops and delivers 'parcels' at just about any designated spot along its route, something the trucking companies appear reluctant to do.

Much has been made of Edmonton's claim to be the gateway to the north and much has been made by civic politicians for Edmonton's

Industrial Airport. Reference to the graphs illustrates just how small is the amount of material moved by air. This, as might be expected, is due mostly to expense, and air transportation, except for emergency shipments, is still restricted mostly to personnel. Only nine percent of the establishments visited suggested that the closing of the airport would have a drastic effect on their business, while forty percent declared that it would have no effect whatsoever. The remainder suggested it would have only a marginal effect. Interestingly, within the latter group were included two establishments whose sole business consists of air transportation and who presently operate out of the airport.

Conclusions Regarding External Economies with Respect to Transfer Requirements

With respect to transfer requirements, there can be no doubt that external economies have developed to a substantial degree. Unlike labour economies, these transfer economies, in the majority of cases, are perceived by the entrepreneurs interviewed as being very important to their respective operations. The fact that twenty percent of those interviewed declared themselves unable to operate without 'external' transfer facilities indicates that these facilities were necessarily high on the list of priorities when initial decisions to locate in Edmonton were made.

External Economies based on Services or Conditions Peculiar to Edmonton

In reviewing Weber's work in chapter three, it was pointed out, that contrary to his writing, which accorded agglomeration to be due to a single cause, there are in fact three possible causes. One of these

is the development of external economies within the firm. A second, which has already been discussed, is the development of external economies within the industry itself. The third cause, is the development of external economies due to urbanisation which arise independently of any one particular industry but whose existence benefits them all. An attempt was made to discover whether any such economies were present within the city which particularly benefited the secondary and tertiary industries associated with the oil industry that are located here. A breakdown of answers received from questions pertaining to such benefits is given in Table 6 - 3.

Edmonton, being the provincial capital contains within its boundaries many departments and offices not found in a city which is not a seat of government. Interviewees were asked whether this factor had any effect on their operations or was useful in any respect. Of the establishments visited, seventy percent suggested that governmental facilities had absolutely no effect on their operation with a further twenty-three percent suggesting that very occasionally were such facilities useful. The remaining seven percent indicated that their presence was useful with reasons such as; access to departments (especially those of labour and highways), access to ministers or officials, guidance with respect to taxation, and the necessity of keeping up with changing regulations, being specifically cited.

The availability of specialised institutions, such as the University of Alberta, the Northern Institute of Technology or the Alberta Research Council had no bearing on the development or operations of the establishments interviewed in eighty percent of the cases. A

Table 6 - 3

Table obtained from results of the questionnaire based on questions applicable to special services or amenities peculiar to Edmonton.

	Maximum Number of Responses		Special Power Needs		Special Service Needs		Occasionally		Use of Government Facilities		Special Facilities in Edmonton	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Manufacturing	15	3 12	1 14		3 2 10		1 4 10		1 4 10		1 13	
Repair and Maintenance (Equipment)	9	1 6	- 7		1 2 6		1 1 7		2 7			
Construction and Installation (Equipment)	6	1 5	1 5		- 1 5		1 1 4		2 4			
Wholesale/Retail	44	2 41	3 39		1 7 34		- 7 35		9 35			
Transportation	8	1 5	- 7		- 5 3		1 - 7		2 5			
Well Service and Completion	16	2 14	1 14		1 4 11		- 2 14		5 10			
Oilfield Construction	10	- 10	1 9		1 2 7		- 1 9		1 9			
Catering	1	- 1	- 1		- 1 -		- - 1		- 1			

Source: Field Data, 1971

further eighteen percent have only marginal use of such facilities. With respect to the Northern Institute of Technology, a special point was made of asking about its effect since its primary function is to train students in the practical. (as opposed to the academic) aspects of jobs. Only in one case did the interviewee respond in any positive manner, while all others suggested that as far as their establishments were concerned, N.A.I.T., had no effects.

In terms of power and services, there appears to be nothing within the city that provides external economies to the establishments under consideration, since in ninety-nine percent of the cases these requirements could be just as easily obtained in other centres of almost any size. These statements reinforce that made in chapter four with respect to Edmonton as a point of location, that is, there is nothing within the city that is of fundamental necessity in the operation of the establishments.

External Economies based on Physical Requirements

With the exception of field and camp construction, transportation and pipe establishments, the physical requirements of the majority of the establishments visited were very standard in appearance. A frontal area was required for office functions, with a much larger storage or shop area behind them. Most of the establishments (all but eleven) were located in designated industrial parks with the greater number being located in the contiguous Argyll Road - Coronet Road Parks. Of the eleven exceptions, the premises consist of a single office; four of these being located in the 'downtown' central business district and

seven of them being located in individual private homes. References will be made to these eleven establishments in chapter seven.

Because of the standard nature of the establishment's needs, all but the larger (usually multi-national and multi-phase) establishments occupy buildings that were built by industrial speculators either for sale or for lease. Examples of such premises in the construction stage can be seen in both these and other industrial areas. With one exception, even those large establishments occupying their own premises had physical appearances similar to the smaller establishments. Capital expenditures in terms of physical plants is not, therefore, considered to be a major expenditure, with the fact that establishments are able to locate in already established buildings in already developed (with respect to services such as roads, water, light, heat and sewer) industrial parks affording to them certain external economies.

With regard to the exceptions listed at the beginning of this section, their primary requirement is space, either for storage purposes or for construction. It was not surprising, therefore, to discover these establishments located on the city's perimeter, all but one having located prior to the extension of city boundaries to their present limits, thus acquiring relatively cheaper land. The various locations of these establishments completely circumvented the city, illustrating the scarcity of available land at reasonable prices.

Summary

Chapter six has shown the existence within Metropolitan Edmonton, of certain external economies which are utilised by the secondary and tertiary sectors of the oil industry located within it. Although present and used by the establishments, they are in most instances, not perceived by the interviewees as being of importance.

The most important of these external economies are the economies of transfer which enable some establishments to remain operative and which undoubtedly make access to the industry easier. Certain labour economies have also developed within the city with respect to the oil industry but this statement must be qualified by adding that these economies apply to the less specialised sectors. Successful specialisation, however, appears to guarantee ease of access to the industry as an independent establishment if so desired.

External economies are also at work with respect to the physical needs of the establishments with the development of fully serviced industrial parks within the city. The proximity of government offices, the University, the Alberta Research Council or other similar institutions, apparently have no bearing whatsoever on the establishments visited.

Of all the economies present, only that concerned with labour can be said to have developed strictly as a result of the oil industry, although some transfer economies are tentatively suggested as developing partly as a result of its needs. Economies based on physical requirements, plus in all probability, certain transfer economies, have been developed within the city of Edmonton in an effort to attract establishments not

only of the oil industry but of all industries. Thus the term urbanisation economies should properly be applied to these forms.

CHAPTER SEVEN

LINKAGES

Due to the mode of the operations undertaken by the establishments visited, none of whom initiate undertakings themselves, but rather operate under contract, the development of linkage patterns between themselves and contracting firms is essential to their survival. Links are particularly pertinent to the eleven establishments visited who occupy either private homes or single offices. Their sole function appears to be that of middle men; receiving orders and transmitting instructions and thus they form links in a communications chain, neither producing, carrying nor consuming materials. The purpose of the present discussion is to try and ascertain what type of linkages have developed, that is whether vertical, horizontal or diagonal, and to see if any of these have developed amongst the establishments under discussion or whether they have simply developed between these establishments and other sectors of the industry.

One of the statements made in chapter three regarding linkages, was that their development made specialisation possible within the industry with various processes or functions being discarded by established firms and undertaken by newly formed companies. Interviewees were asked, therefore, whether or not they had become more specialised in their operation since their entry into the field. A total of 109 responses was gained (that is the full sample population) and of these fifty-one (fifty percent) declared that they had become very much more specialised.

Table 7 - 1

Table obtained from results of the questionnaire based on questions pertaining to specialisation

	Maximum Number of Responses	Single or Multiple Plant	Functions of Company Plants in Alberta	Specialisation	Expansion into New Areas of Business
		Single or Multiple	Yes Different function Less, plus more Exactly the same	Yes Marginally No	Yes Marginally No
Manufacturing	15	9 5	3 2 - -	10 3 2	5 5 5
Repair and Maintenance (Equipment)	9	7 2	1 1 1 -	4 4 1	1 2 6
Construction and Installation (Equipment)	6	3 3	- 1 2 -	3 3 -	3 1 2
Wholesale/Retail	44	10 28	10 12 8 1	27 10 7	9 22 13
Transportation	8	6 2	1 - - 1	2 5 1	3 4 1
Well Service and Completion	16	6 9	2 1 4 -	5 5 6	5 5 6
Oilfield Construction	10	5 5	2 - 3 -	- 10 -	2 6 2
Catering	1	- 1	- - 1 -	- 1 -	- 1 -

Source: Field Data, 1971

a further forty-one (thirty-nine percent) suggested that they had become marginally more specialised, with the final seventeen (eighteen percent) indicating no change since beginning their operation. Of these latter seventeen, seven were engaged in wholesale/retail operations and these establishments suggested that the products handled were very much more specialised but that their own operation had not really changed. The answers to the questions pertaining to specialisation are tabulated in Table 7 - 1. Degrees of specialisation varied and a few examples are presented to illustrate this. One establishment visited existed solely as a pipe storage facility, the establishment neither manufactured nor processed the pipe. Another, already referred to, simply made injection systems used at well heads or at refineries; another was concerned with certain welding techniques and yet another was concerned with the cleaning and maintenance of filters.

Transportation has developed three degrees of specialisation recognised within the industry as heavy oilfield hauling, light oilfield hauling and 'hot-shot' trucking. At least one of each type was contacted.

Complementing the question pertaining to specialisation, a further enquiry was made regarding expansion into new areas of endeavour either within the oil industry or outside of it. Again, a full complement of responses was gained with the results as follows: thirty-five (thirty-four per cent) responded with no change, forty-six (forty-four percent) suggested only marginal expansion with the remaining twenty-eight (twenty-three percent) indicating that they had entered into new areas of business. In looking at the two sets of answers together, it would appear that most of the specialisation that has occurred within

the establishments visited has occurred in those areas of operation that the establishment was originally engaged in, that is, some initial responsibilities have been discarded to other establishments rather than new responsibilities added.

Transport Links

With respect to transportation linkages, attention is again drawn to the graphs, figure 6 - 2 page 92, indicating the amount of goods and services moved by private, common carrier, road transportation. As already mentioned, specialisation occurs within the transportation industry into heavy, light and hot-shot hauling. Hot shot trucking is broadly defined as trucking that will take anything, anywhere, at a moments notice. Its function and its equipment are similar in many respects, to light oilfield hauling, with the only apparent differences being a somewhat less structured and less elaborate operation with a tendency towards small independent companies. Two of the eight transportation establishments visited were located in private homes and belonged to the category hot shot trucking. The need for such establishments has dwindled over the last decade as the fields within the immediate vicinity of Edmonton have been developed and stabilised.

Links between hot shot and light oilfield hauling and between other establishments of the secondary and tertiary sectors of the oil industry are many and varied. On the whole, the links are between transportation and manufacturing, and transportation and repair, rather than transportation and other establishments. Company vehicles play an increasingly large part in wholesale/retail transactions. Since the fields in the vicinity of Edmonton have been developed, links between heavy oilfield hauling and the establishments in question are not too

apparent, as heavy hauling means the movement of rigs and other such equipment. Such hauling now occurs mostly at considerable distances from Edmonton and mostly in the northern parts of the province or in the Northwest Territories. In most instances, the equipment required is located at points close to the area of operations (for example at Zama Lake) and only contacts between the contracting parties take place within the city of Edmonton with the fruition of such contacts taking place elsewhere. This mode of operation further reinforces the statements made in chapter five with respect to the areal distribution of the market and the market at a point located within Edmonton.

Certain transportation establishments of the light oilfield hauling variety have gone out of their way to guarantee markets and in so doing have established definite linkages. One such example is the firm already mentioned which stores pipe. This particular operation is a wholly owned subsidiary of a trucking establishment which specialises in moving oilfield equipment and maintains a fleet of vehicles designed specifically to move pipe.

Questions aimed at garnering information about linkages, must of necessity be very broad and thus subject to a great deal of interpretation, or very indirect, since establishments are very reluctant to divulge information wherein other establishments are mentioned specifically by name. In an attempt to discover whether linkages are in fact present, the very indirect question was asked, Do you have working agreements, that is, do competing firms co-operate if necessary, with other similar firms within the city? This question required some explanation to the interviewees but was asked for the reasons outlined

above. In terms of the transportation sector, the explanation brought forth the information that among the larger concerns, an agreement is in effect which entails the passing on of business from one concern to another in the event that the original firm contacted is unable to handle all or any of the business generated. In return, a certain percentage of the profit realised by the receiving firm is paid to the generating firm. It was thought that such a practise was standard throughout the trucking industry regardless of specialisation and was certainly so amongst oil industry establishments. A footnote to this statement was to note that such an arrangement applied only to the larger firms. Confirmation of this footnote was found in the responses regarding agreements of the smaller transportation establishments visited. In each case the response was "No".

Since neither construction, nor processing is undertaken by the transport concerns, it is somewhat difficult to place linkages generated into the horizontal or vertical category. It was felt, however, that some differentiation should be made between linkages derived within the sector, that is, agreements between similar concerns, and the diagonal linkages derived between transportation concerns and other establishments associated with the oil industry. Presently, such a differentiation and its resultant terminology is lacking.

Intra-Establishment Links

When discussing labour requirements of the various establishments interviewed, it was noted, that the greater number of them required a mixed labour force with respect to skills. This, in part, is

due to the fact that many of the establishments visited have more than one function, a major and a minor. Answers to questions regarding secondary activities provide interesting linkage patterns. These are tabulated in Table 7 - 2.

Reasons for the varying degrees of skill requirements of individual establishments can be derived from the table, since it would be natural to assume for example, that more mechanical skill would be required to repair and service equipment than would be needed in selling it across the counter.

Explanations for operational linkages developed within wholesale/retail establishments lie in the nature of the establishments. All but seven of the forty-four wholesale/retail establishments visited were manufacturers' agents for at least some of their products. That is, establishments are contracted by various manufacturers to handle certain goods. Being contracted, often exclusively, (within the city) manufacturers train personnel in the installation and maintenance of their products. The table indicates that instead of maintaining separate establishments for service personnel, they are often associated directly with the sales establishments.

Links between manufacturing and repair and maintenance are expected ones, since regardless of industry type, most manufacturers tend to try and achieve the reputation of 'standing behind' their products. Other intra-establishment links are also readily apparent, being 'natural' for example, oilfield construction, with oilfield maintenance, and none discovered appeared to be unusual or unexpected.

Those establishments reporting that they had no secondary

TABLE 7 - 2 ILLUSTRATES THE PRIMARY AND SECONDARY FUNCTIONS
OF THE ESTABLISHMENTS INTERVIEWED

Number of Establishments	Primary Function	Secondary Function
20	Wholesale/Retail	Repair and Maintenance (Equipment)
10	Wholesale/Retail	Manufacturing
1	Wholesale/Retail	Transportation
8	Manufacturing	Repair and Maintenance
1	Manufacturing	Wholesale/Retail
1	Manufacturing	Construction and Install- ation (Equipment)
5	Oilfield Construction	Oilfield Maintenance
1	Oilfield Construction	Manufacturing (Camps and Field Equipment)
3	Construction/Installation	Repair and Maintenance (Equipment)
1	Construction/Installation	Wholesale/Retail
1	Construction/Installation	Transportation
2	Repair and Maintenance (Equipment)	Manufacturing
1	Repair and Maintenance (Equipment)	Construction and Installation
2	Well Service and Completion	Wholesale/Retail
1	Well Service and Completion	Construction and Install- ation (Equipment)
1	Well Service and Completion	Oilfield Construction
1	Transportation	Repair and Maintenance

Source: Field Data, 1971

functions provide interesting speculations with regard to linkage potentials. As mentioned above, all but seven of the forty-four whole-sale/retail establishments are manufacturers' agents, thirty-one acknowledge intra-establishment links leaving thirteen who do not. Subtracting the seven manufacturers' agents who did not report intra-establishment links still leaves six wholesale/retail establishments without any internal linkage with respect to repair and maintenance, or construction and installation. It is conceivable that these services are not required but it is equally possible that these functions are undertaken by other establishments who list them as their primary functions.

From the above discussion, it is again not possible to declare categorically that intra-establishment links are either vertical or horizontal, some element of each one being present. The predominant form of linkage appears to be that of ownership wherein control or contracts from a location outside of Edmonton establish the functions undertaken by each separate establishment. The ownership linkage is especially prevalent between manufacturing and sales establishments. The predominance of foreign made products, mostly from the United States but some from Europe and increasingly from Italy and Japan, make the distances over which the linkages operate particularly interesting.

Inter-Establishment Links

From the outset of the field work, it became increasingly apparent that the secondary and tertiary sectors of the oil industry are fiercely competitive. It also became apparent that any attempt to gain

specific information with respect to differing firms with whom contacts were maintained would be met with resistance. (For examples of the competitiveness, see appendix nine).

The competitiveness has certain implications with regard to inter-establishment links in that the establishments concerned with similar undertakings had little or no contact with each other from a business point of view. In the course of the interviewing, specific questions were asked such as; If an order came to your establishment which you were unable to fill, are there other companies with similar products that you could contact or recommend? In all cases the answers were a definitive, "No". Expansions on this answer ranged from the fact that such an eventuality could not occur because air transportation was available for emergency shipments from parent establishments or other company establishments elsewhere, to statements that an establishment caught in such a position would soon be out of business.

Links have already been established between the larger transportation companies with respect to services. Supply links to these establishments are from outside of the oil industry, that is the sectors under consideration, with trucks, parts and machinery being supplied by the automotive industry. Supply links for industries concerned with the construction and maintenance of oilfields, camps and other similar activities are also primarily from outside the oil industry with heavy machinery such as 'Cats' and scrapers coming from the automotive industry and lumber, insulation and related materials coming from the construction industry.

Linkages between the establishments under consideration can be established between the supply houses on the one hand and the oil field services, such as well service and completion, directional drilling, and oilfield welding on the other. The evidence for such observations are based on the question; Do you buy your raw materials or supplies directly from the manufacturers? This question had to be modified to include manufacturers' agents because supplies are both ordered and delivered through such establishments. The interviewees, however, regarded such transactions as being direct manufacturer contacts.

From the total of seventy-seven establishments who stated that they received supplies directly from the manufacturers, must be subtracted those establishments receiving supplies from outside the oil industry. These include transportation, oilfield construction, catering and supply houses leaving in effect only those establishments concerned with well service and completion plus oilfield repair and maintenance. Thus, the seventy-seven reduces to nineteen of which eleven, who responded to a direct manufacturer contact, acknowledge that this contact is through a manufacturer's agent.

Reference is now made to Table 7 - 3 in which questions concerning the acquisition and dispersement of supplies and services has been tabulated. These questions were asked in order that any supply and sales links might be identified. A breakdown of the answers given reveals that twenty-two establishments use only wholesale/retail outlets located within Edmonton while twelve obtain at least some of their supplies from such outlets. This total of thirty-

four responding establishments includes the whole spectrum of establishments visited but of these, nine are engaged in repair and maintenance of oilfield equipment and in well service and completion. A surprising total of seven wholesale/retail outlets report obtaining at least some of their supplies from other wholesale/retail outlets within the city. This confirms the statement made during one interview that 'we buy and sell to each other all the time'.

The dominance of the United States as a whole and the Houston/Dallas area in particular with respect to manufacturing has already been pointed out. The implications contained within this statement are particularly pertinent with respect to the manufacturing sector of the oil industry throughout Canada as a whole and in Edmonton specifically. The Western Canada Oilfields centred in Alberta, must by any standard be regarded amongst North America's largest, yet it is to a large extent true that they have generated relatively little secondary manufacturing in terms of oilfield equipment. Examples where this has not occurred is in the development of alloys which are capable of withstanding large temperature ranges with the colder end of spectrum being the most important in the northern Canadian context. These and materials like them are presently all developed, tested and produced in the United States. What makes this particular example ironical is that special cold laboratories have been built in Texas to simulate field conditions in Northern Canada.

The definition accorded vertical linkages for the purposes of this study was that goods passed on from one stage to another for further processing. In order to establish whether such links were present,

interviewees were asked a series of questions regarding their goods and services. Reference is again made to Table 7 - 3 for a comprehensive breakdown of the answers received. Responses to these questions reveal that vertical linkages are almost nil within Edmonton's secondary and tertiary sectors of the oil industry with ninety-six establishments indicating that their goods and services finished products that can be used directly by the buyers and require no further processing. This finding further reinforces those previously made regarding the lack of secondary manufacturing within the city. A total of forty-eight establishments report that their goods and services are produced on a contractual basis, that is the service is provided for the customer when and where it is needed but that this good or service is a finished product in itself, for example, well cementing. A further twenty-seven stated that their product was used by other establishments in their operation (an indication of horizontal linkages) while fourteen stated that their products went directly to wholesale/retail outlets. The remaining respondents indicated that their products or services were distributed in a variety of ways.

In whatever manner products and/or services are distributed, a total of ninety-two of the interviewees declared that they go to other establishments which are primarily engaged with the oil industry. This was the most direct evidence obtained that admitted linkages to be present. Establishments marginally engaged in the oil industry were supplied or serviced by twelve of the establishments visited while one suggested that his sales went to a variety of establishments. A further indication that linkages are present within Edmonton is garnered from

Table 7 - 4

Table obtained from results of questionnaire based on questions pertaining to functional linkages with firms having similar operations.

	Maximum Number of Responses	Very Important	Marginally Important	Not Important	Importance of Similar Firms
Manufacturing	15	7	4	4	
Repair and Maintenance (Equipment)	9	2	3	4	
Construction and Installation (Equipment)	6	1	5	-	
Wholesale/Retail	44	12	18	13	
Transportation	8	1	4	3	
Well Service and Completion	16	2	6	7	
Oilfield Construction	10	1	1	7	
Catering	1	-	1	-	

Source: Field Data, 1971

the information regarding place of sales. This has already been dealt with in chapter five which showed the city of Edmonton to be the fourth largest market for establishments located within the city.

Other hints to existing linkages were obtained from questions designed primarily for arriving at different information. For example, questions were asked regarding the availability of services within the city with the intention of gaining information pertaining to power, banking, schools etc. Answers, however, contained information such as; 'the availability of machine shops made Edmonton a logical location spot', 'the availability of specialised supplies and workers' was another important factor, small 'personal' industries was yet another factor specifically cited while access to man power was also mentioned.

Finally, in response to a final question designed specifically to obtain information regarding linkages, twenty-seven establishments declared that the presence of similar and associated establishments was very important to their operation, forty-four declared that it was marginally important while thirty-six suggested that it was not important at all. A breakdown of these results is given in Table 7 - 4. These responses suggest that the thirty-six establishments with a negative answer have few functional linkages within the city, and further, that they have little perception of the importance of contacts, for as will be shown in the following section, face to face contact with associated establishments is regarded as the most important of all contacts. The thirty-six responses also give a further indication as to the competitive nature of the industry. Typical comments gained from the thirty-six ranged from, 'we'd do more business with fewer competitors', to, 'there are far too many firms competing for too little business'. Conversely

Table 7 - 5
Table obtained from results of the questionnaire based on questions pertaining to
Communications Linkages.

	Customers -----												Business Associates ----					
	Maximum Number of Responses			Most Important			Second Most Important			Third Most Important			Most Important			Second Most Important		
	Face to face	Telephone	Mail	Face to face	Telephone	Mail	Face to face	Telephone	Mail	Face to face	Telephone	Mail	Face to face	Telephone	Mail	Face to face	Telephone	Mail
Manufacturing	15	13	1 1 1	1	8	2	1	3	8	10	2	1	1	6	4	3	2	6
Repair and Maintenance (Equipment)	9	7	2 -	2	5	-	-	-	7	5	2	-	2	4	-	-	-	6
Construction and Installation (Equipment)	6	6	- -	-	5	-	5	-	-	5	1	-	1	4	-	-	-	5
Wholesale/Retail	44	36	8 -	6	34	1	-	1	40	23	15	2	16	22	-	1	1	36
Transportation	8	6	2 -	2	6	-	-	-	8	5	2	1	3	5	-	-	1	7
Well Service and Completion	16	15	1 -	-	15	-	-	-	15	12	3	-	3	11	-	-	-	14
Oilfield Construction	10	9	1 -	1	9	-	-	-	10	8	1	1	1	9	-	1	-	9
Catering	1	1	- -	-	1	-	-	-	1	1	-	-	-	1	-	-	-	1

Source: Field Data, 1971

it is suggested that the twenty-seven establishments which declared the importance of similar or related establishments to their operations have, firstly, close functional linkages within the city, and secondly, a greater perception of the importance of these linkages to their day to day operation.

Communications Linkages

As the interviews progressed, it became increasingly apparent that one of the more important, if not the most important, linkage between establishments was that of personal contact. This manifested itself in several ways, the most obvious ones being, the appointments of the establishments visited and the number of persons found in the establishments who did not work there but rather for different companies.

Several establishments visited, especially those concerned with oil well servicing and completion, the larger transportation companies and the larger supply houses, had very elaborate settings and furnishings, some with wall to wall carpeting, wood panelling and plush chairs. Adjoining the offices, the same warehouse type of building was present but initial impressions were of subdued luxury. While such elaborate settings were not the rule, neither were they the exceptions. The exceptions were the very few establishments visited that were untidy, run down and appeared dirty. The great majority fell somewhere in between with the emphasis towards the luxurious. In a number of cases, before an interview began, the interviewee, besides introducing himself also introduced a further party 'who does not belong here' or 'who worked for establishment X'. In one instance a double interview was undertaken since the person present was coincidentally scheduled for the next interview.

These subjective views on the importance of personal contacts were strongly borne out by the answers to questions forty-five to forty-eight inclusive. Only the results of questions forty-five and forty-seven will be considered (see appendix two) for it was discovered that in the vast majority of cases, customers and business associates were one and the same.

The results of these questions are tabulated in Table 7 - 5. On the basis of these results it is estimated that approximately sixty-four percent of all the business undertaken by the establishments visited is initiated from a face to face contact with ninety-two establishments declaring that this form of contact was by far the most important as far as the operation of their establishments was concerned. Next in order both of actual operation and of perceived importance was the telephone, being used for forty-six percent of all the business transactions and regarded by fifteen of the establishments as being of major importance over face to face contacts. Use of the mail service was not considered important except for confirmations, billings and receipts. Not listed on the questionnaire was the teletype as a source of communications. Its presence, however, was noted in several of the larger establishments. The presence of this machine was further evidence of the necessity of maintaining instant communications in a business that is subject to 'emergency' requirements and further strengthened the evidence that communications linkages are very important in the operation of the sectors under consideration as associated with the oil industry.

Summary

The wealth of information gained from the questionnaire and from additional comments made by the interviewees, has demonstrated that a complex network of linkages has developed within the secondary and tertiary sectors of the oil industry as it is located in Edmonton.

The present chapter has shown that links are present between establishments concerned with dissimilar but related functions but that with the exception of the larger transportation establishments, those concerned with similar functions are fiercely competitive and have little or no contact with each other.

Having established that linkages are, in fact, present, it remains to try and classify them within the framework outlined in chapter three. Additional manufacturing and processing of parts and equipment beyond that done by the establishments under consideration, has been shown to be lacking thus the incidence of vertical linkage patterns are very limited. Some horizontal linkage patterns are present, demonstrated by the fact that some of the products sold are to be used in another establishment's products. Not all of these, however, are sold within Edmonton but are shipped to other locations for 'on site' construction. The strongest linkage patterns established are those of diagonal linkages, where products and services, are provided at more than one point within the oil industry. Some of these links are found in the secondary and tertiary sectors, that is within the sectors in which they originate.

By far the most significant linkages discovered within the industrial sectors under consideration are those of face to face contacts.

Exactly how they operate is not apparent from the present study. In most instances the conversations observed between personnel from different establishments appeared to be concerned more with golf scores and vacations than with the oil industry, but the effort made to cultivate these contacts and the importance attached to them by the interviewees indicate that they are of great value in the day to day operation of the establishments visited.

CHAPTER EIGHT

SUMMARY AND CONCLUSIONS

Before attempting to summarise the results obtained from the present study, it is appropriate at this time to review the hypotheses upon which the study was built. These hypotheses as set forth in chapter three are:-

1. With regard to locational aspects, it is expected that the secondary and tertiary sectors of the oil industry located in Edmonton are market orientated.

2. With regard to agglomeration, it is expected that those portions of the secondary and tertiary sectors of the oil industry which have concentrated in Edmonton, have done so because of the advantages that have accrued to individual establishments by such concentration.

2a. It is expected that, the concentration of the secondary and tertiary establishments associated with the oil industry as it is located within Edmonton has been both the result of and the cause for, the development of external economies. The presence of these external economies has, in turn, allowed establishments to specialise in particular facets and thus contribute their specialties to the industry as a whole; further, the presence of these external economies permits the small independent company not only to form but to remain viable.

In an attempt to summarise the questions asked during the interviews, all of which were aimed at one or more of the given hypotheses, a final question was asked wherein interviewees were requested to rank

in order, one to nine, given factors which may have been instrumental in their decision to locate in Edmonton. From the responses given, the weighted Table 8 - 1, has been derived. The factors are listed in order of perceived importance.

The table helps to reinforce the factors already discussed in the previous pages. The establishments under consideration are overwhelmingly market orientated. It is felt that the high ranking of plant site being advantageous is yet another declaration, at least partially, that the site is close to the market rather than that the site itself possesses advantages not found elsewhere. This supposition is based on the fact that any one of the establishments visited with the exception of the transportation and construction establishments could have moved into other premises in a physical sense, the requirements for each being so very similar.

With respect to available literature, market orientation was an expected phenomenon of secondary and tertiary industry and thus the present study reinforces the literature and at the same time indicates that within the limits set by the study objectives, the first study hypothesis is true.

Again, with respect to available literature, agglomeration economies are said to be at work if it can be demonstrated that concentration has taken place at one location with respect to other locations and that production is taking place over and above that required to fulfil local market needs. Chapter four showed that both these criteria had been met by the oil industry within Edmonton. Further, the working hypothesis indicated that if agglomeration economies

TABLE 8 - 1

LOCATION FACTORS RANKED IN PERCEIVED ORDER OF IMPORTANCE

Factors	Rank									Total
	1.	2.	3.	4.	5.	6.	7.	8.	9.	
Markets	78	16	3	3	-	-	-	-	-	869
Transportation Availability	3	36	21	10	2	3	2	-	-	550
Plant Site Advantageous	6	11	14	7	6	2	2	-	-	329
Closeness to Similar Industries	1	7	18	11	7	3	3	2	-	317
Labour Supplies Available	-	10	13	10	7	11	-	1	-	312
Material and Supplies Available	1	10	11	7	5	2	5	3	-	262
Edmonton, Owner's Home Town	14	2	5	2	7	-	2	7	1	245
Power Supplies Available	-	-	3	2	4	7	9	5	-	118
Government Offices Available	-	3	1	3	1	3	3	10	-	95
	103	95	89	55	39	31	27	28	1	

Source: Field Data, 1971

are at work, specialisation takes place within the industry allowing for new establishments to develop in specialised areas. Chapter seven has shown that this also has occurred in Edmonton within those sectors under study. Indirectly, this specialisation is indicated by Table 8 - 1 in the high ranking accorded the necessity of being close to similar or related industries. Chapter six has shown that the competitive aspects of similar establishments prevents their contacting each other, which leads to the conclusion that it is the nearness of related industries which is the most important aspect. Evidence for such a conclusion, that it is the related industries which are important, is also found in chapter six wherein important services available in Edmonton are cited as being related industries. The high ranking of plant site being advantageous might also be partially due to the proximity of similar or related industries both from a service stand point and from an ease of access standpoint.

The summary of chapter five tentatively suggested the existence of agglomeration economies in light of evidence presented there. A firm conclusion was not made, however, since it was felt that further evidence was required. It is felt that chapters six and seven have each added information and on the basis of all the evidence gained; concentration, overproduction, external economies and urbanisation economies all being present, the firm statement can now be made, that agglomeration of the secondary and tertiary sector of the oil industry has taken place within the city of Edmonton during the twenty-four years since these sectors first located here. Because this statement is felt to have been shown to be true, it is also felt that the first part of the second study

hypothesis has also been shown to be true, that is, agglomeration with its associated specialisation, has indeed taken place.

Implicit within this declaration is the acknowledgement of the presence of external economies. In the present instance, those of transfer economies appear to be dominant. This conclusion derived from information presented in chapter six is further reinforced by the high ranking of transport availability in Table 8 - 1. The availability of labour is ranked in the middle of Table 8 - 1, which reflects quite accurately the findings shown in chapter six, that is, labour availability is of importance but is not of overriding importance in locational decisions. Because at the outset of the oil era in 1947, there were, according to Nickle's register, few, if any, secondary or tertiary establishments associated with the oil industry present in Edmonton, the building of a labour pool has occurred within the last twenty-four years. The implications to this statement are several; either the labour has been drawn from existing industries within the city, or additional labour has been drawn to the city from elsewhere. A glance at the population statistics from 1951 to 1961 for Metropolitan Edmonton show a jump from 176,782 to 337,568, an increase of approximately ninety-one percent. While it would be naive to suggest that all of this increase represents an oil industry labour force it would be equally naive to suggest that none of the increase was in response to labour requirements within the industry. The attractions of a better job are undoubtedly strong forces in causing people to migrate to new areas. Having once done so, the new area must supply certain amenities to cause persons to stay. These amenities must also be

considered as a form of external economy and must properly be listed under external economies of urbanisation being part of the infrastructure of the environment.

With respect to the availability of materials and supplies, it is not clear from the answers given, whether their availability caused a concentration of establishments needing them or whether the concentration of establishments resulted in making a large pool of supplies and materials available. Probably the solution lies somewhere between the two extremes. Other amenities and services are not important location factors, according to the direct results obtained.

What has become evident from the study is the fact that it is presently much easier to enter into the field under discussion as an entrepreneur, than it was as little as a decade ago, and this in no small measure is felt to be due to the existence of external economies. Evidence in support of this statement is found in analysing the ages of the establishments visited. Chapter five revealed that only thirty-three of these were twenty operational years of age or more. Of this thirty-three, a sample of six was taken. In each case the establishment was part of a multi-plant company and in two instances, key personnel were non-Canadian. At the other end of the time scale, six establishments of less than a decade of operational age were reviewed. In this instance, five of the six were self employed entrepreneurs employing fewer than ten persons. The sixth was part of a multi-plant complex. This analysis, combined with the evidence already presented regarding the existence of external economies, specialisation and agglomeration, was felt to have shown that study hypothesis 2a is also true.

Of all the external economies to which attention has been paid, that of linkages appears to have an importance which is manifest in several ways but not easily measured. Of the linkage types outlined in chapter three, there has been some evidence to suggest the presence of vertical and horizontal linkages, but of the three types outlined, diagonal linkages are the most prevalent. Those linkages that have developed have done so between different segments within the sectors under consideration and not between establishments of similar function. Even more important than the presence of the common linkage type, appears to have been the development of communications linkages, especially of the face to face variety. The effort made to cultivate and maintain them and the visual evidence of their presence indicate that they have an importance which may be greater than one or all three of the conventional linkage patterns combined. Exactly how they operate is not so readily apparent. It is felt that the importance of face to face linkage appears in Table 8 - 1, in the high ranking given to market orientation. Chapter four dealt at some length with the two concepts of market, the areal market and the market at a point. The development of industrial parks by the city of Edmonton, the building of facilities and the providing of amenities are in this respect all part of the infra-structure of the city that makes ease of access to customers and business associates alike, that much easier; thus market orientation is felt to be directed at this facet of the industry as well as to the actual spatial area of sales.

A final linkage that can be derived from Nickle's Oil Register as well as from field observations, is that of ownership links, either

in an absolute sense or in a contractual sense. Many of the establishments visited, especially those concerned with wholesale/retail operations are owned or controlled by parent companies located outside of Edmonton and usually outside of Canada. Many of the instructions and the orders received by the establishments visited come from outside of the city and most of them are also filled outside of it. As far as the secondary and tertiary sectors of the oil industry are concerned, the city of Edmonton acts much like a reservoir, as a collection and distribution centre, and thus continues to fulfil the function that has been historically derived from its founding.

Study Implications and Further Study Areas

When oil was first found in north central Alberta, there were no established oil centres. The oil was originally found closer to the already existing village of Leduc than it was to Edmonton. As further discoveries were made, the town of Devon was created as an oil service centre. Yet neither Leduc, nor Devon nor subsequently other towns closer to large oil finds than Edmonton, developed as dominant oil service towns. The main reasons for Edmonton's predominance appears to have been the already existing infra-structure not the least important of which was its nodality with respect to transport links. Although external economies have been developed by the oil industry within Edmonton, those external economies developed during the growth of the city, that is, economies of urbanisation, have also apparently made considerable contributions. The significance of these findings when applied to small towns and their desire for expansion, or, for

the development of growth poles, would seem to be great. Secondary and tertiary industries develop in response to markets and thus before these industries can be expected to locate within communities, the presence of a market must first be established or assured. In the case of the oil industry, such a market has been developed around a natural resource and while it is not feasible to expect natural resources to abound close to every community desirous of expansion, it would appear that the development of a basic industry is a prerequisite for service industry location.

The infra-structure of the community would seem to play at least as large a part as that of basic industrial development and especially important would appear to be communication links. Nodality, certainly in the case of Edmonton, appears to have been one of the most important factors leading towards its development.

Some of these factors, nodality for example, seem to be the result of historical accident; others, such as the development of well serviced industrial parks, well planned and well administered urban centres are the result of careful planning and judicious administration and it is the latter which must be developed by the smaller communities if lack of the former is to be overcome.

Several of the conclusions reached by the present study leave questions unanswered and provide topics for further research. A tracing of the development of private road transportation within Edmonton and its over all effects on the city in terms of industrialisation and growth, is one. Another, and much more difficult topic to approach is the question of communications linkages, how they operate and what their

overall importance is in the total scheme of things, especially as it is related to spatial distribution. In relation to transportation and communication and communications linkages, the functions and effects of the two airports within Edmonton need further research both from a historical geographical point of view and from an industrial geographical point of view.

While the working hypotheses of the study have been shown to be true, the market orientation of the secondary and tertiary establishments associated with the oil industry should be providing the Edmonton civic administration with food for thought. Any new oil strikes in western Canada are most likely to occur in the far north and while Edmonton has traditionally been acknowledged as the 'Gateway to the North', steps are necessary to ensure that this position remains unchanged. The development of the White Pass Railway, the completion of the Yellowhead Route for trucks and the development of interior roads in British Columbia make Vancouver an increasingly viable alternative as a northern supply centre.

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SECONDARY AND TERTIARY INDUSTRIES ASSOCIATED WITH THE OIL INDUSTRY

LOCATION QUESTIONNAIRE

Part 1. General Information

1. What kind of business are you primarily (more than 50%) engaged in?

Manufacturing _____
Repair/Maintenance (Equipment) _____
Construction/Installation (Equipment) _____
Wholesale/Retail _____
Transportation _____
Well Service/Completion _____
Oilfield Maintenance _____
Catering _____

2. What kind of business are you secondarily engaged in?

Manufacturing _____
Repair/Maintenance (Equipment) _____
Construction/Installation (Equipment) _____
Wholesale/Retail _____
Transportation _____
Well Service/Completion _____
Oilfield Maintenance _____
Catering _____

3. How many years have you been in operation? _____

4. Have you expanded into new aeras of business since first beginning your operation?

Yes, into many new areas _____
Yes, but only a few new areas _____
No change _____

5. Have you become more specialised since first beginning your operation?

Yes, very much more specialised _____
Yes, but only marginally more specialised _____
No change _____

Part 11. Plant location

6. Have you relocated from elsewhere outside the city of Edmonton?

Yes _____ Previous address, (town/province) _____

Year of move _____

Reasons for move. 1. _____

2. _____

No _____

7. What other cities or regions, if any, were considered as possible locations other than Edmonton? Please list: _____

8. Once you had decided to open an establishment, what made you decide to locate in Edmonton? Please list: _____

9. Has your firm changed its location within Edmonton?

Yes _____ Previous Address _____
 Year of move _____
 Reasons for change (e.g. move closer to suppliers etc.)

1. _____
2. _____
3. _____

10. If you had the location decision to make again, would you still locate in Edmonton?

Definitely yes _____
 Probably yes _____
 Probably no _____
 Definitely no _____

11. If the answer to question 10 was either, probably no or definitely no, what has changed to make you change your mind? (e.g. markets have moved etc.)

Please List. 1. _____
 2. _____
 3. _____

12. In making your decision to locate in Edmonton, did you contact or consult with any of the following regarding amenities services etc.. Please check.

Edmonton Chamber of Commerce _____
 Edmonton Industrial Office _____
 Edmonton Planning Office _____
 Edmonton Utilities _____
 Edmonton Industrial Airport _____
 A Professional Industrial Location Consultant _____
 Other Organisation, Please Specify _____
 No organisation contacted _____

Part III. Products and Raw Materials

13. Do more than 50% of your raw materials/supplies, come from

Within the city of Edmonton _____
 Elsewhere in Alberta _____ Please specify _____
 Elsewhere in Canada _____ Please specify _____
 Elsewhere excluding the U. S. and Canada. Please Specify. _____

The U. S. A. _____

14. Do you buy your raw materials/supplies directly from the manufacturers'?

Yes _____ Manufacturers' Agents _____
 No _____

15. If the answer to question 14 is no, do you use wholesale/retail firms;

Within the city of Edmonton _____
 Outside the city of Edmonton _____
 A combination _____ Please give approximate % _____ % & _____ %

16. Is your product (good or service) _____
 A finished product or part that can be used directly by the consumer _____
 A semi finished product or part which needs further processing before _____
 it can be used by the final consumer _____
17. To whom does your product (good or service) go?
 Other firms to use in their products _____
 To wholesale/retail outlets _____
 Products produced on a contract basis _____
18. Are the firms to whom you sell most of your products
 Primarily engaged in the Oil Industry _____
 Marginally engaged in the Oil Industry _____
 Not engaged in the Oil Industry _____
19. Are the firms to whom you sell your products
 Mostly located within Edmonton _____
 Mostly located outside of Edmonton _____
20. If your product (good or service) requires further processing, is
 this processing done within the city of Edmonton?
 100% _____
 75% _____
 50% _____
 25% _____
 None _____
21. If less than 50% of further processing is done in Edmonton, where is
 the product sent for further processing? Please Specify.
-

Part 1V. Labour

22. How many permanent employees have you?
 1 - 5 _____
 5 - 10 _____
 10 - 15 _____
 15 - 20 _____
 Plus 20 _____ Please Specify _____
23. Do you have seasonal labour requirements?
 Yes _____
 No _____
24. If the answer to question 23 was **yes**, when is your greatest demand
 for labour?
 Spring _____
 Summer _____
 Fall _____
 Winter _____
 Varies _____
25. Do you have a large turn over of labour?
 Large turn over _____
 Very stable labour force _____
26. Is your labour of a skilled or un-skilled type?
 Skilled _____
 Un-skilled _____
 Mixed _____ Please give approximate %'s _____ % & _____ %

27. Is labour of both types readily available?

Always _____
 Usually _____
 Skilled labour hard to obtain _____
 Un-skilled labour hard to obtain _____
 All labour hard to obtain _____

28. Do you have to train or retrain labour (or give additional training)

Always _____
 Usually _____
 Sometimes _____
 Never _____

Part V. Power and Services

29. Does your firm require the use of any special form (e.g. D.C. electricity) or quantity of power?

Yes _____ Please Specify _____
 No _____

30. Does your firm require the use of any particular or special service? (e.g. fire protection - beyond "normal" requirements etc.)

Yes _____ Please Specify _____
 No _____

31. Is the close proximity to the government offices useful in the operation of your business? (e.g. access to ministers etc)

Yes _____ Please Specify _____
 Occasionally yes _____
 No effect _____

32. Is the close proximity of the University, N.A.I.T, the Alberta Research Council or similar research Institutions useful in the operation of your business? (eg. supply of trained personnel, up to date information etc.)

Definitely yes _____
 Occasionally Yes _____
 No effect _____

33. Do you use any form of service that is readily obtainable in Edmonton that would be harder to obtain elsewhere?

Yes _____ Please Specify _____
 No _____

Part VI. Transportation

34. How are the majority of "raw" materials/supplies moved to you?
 Please give approximate %'s.

Company vehicles _____, _____%
 Public Road Transport _____, _____%
 Rail _____, _____%
 Air _____, _____%

35. How are the majority of your products/services moved to your customers?
 Please give approximate %'s.

Company vehicles _____, _____%
 Public Road Transport _____, _____%
 Rail _____, _____%
 Air _____, _____%

36. Without the existence of independent public carriers (road) either local or long distance, would your firm still be able to operate?

Yes _____
 Yes, but at a great disadvantage _____
 No _____

37. Is the close vicinity of the industrial airport important to your firm?

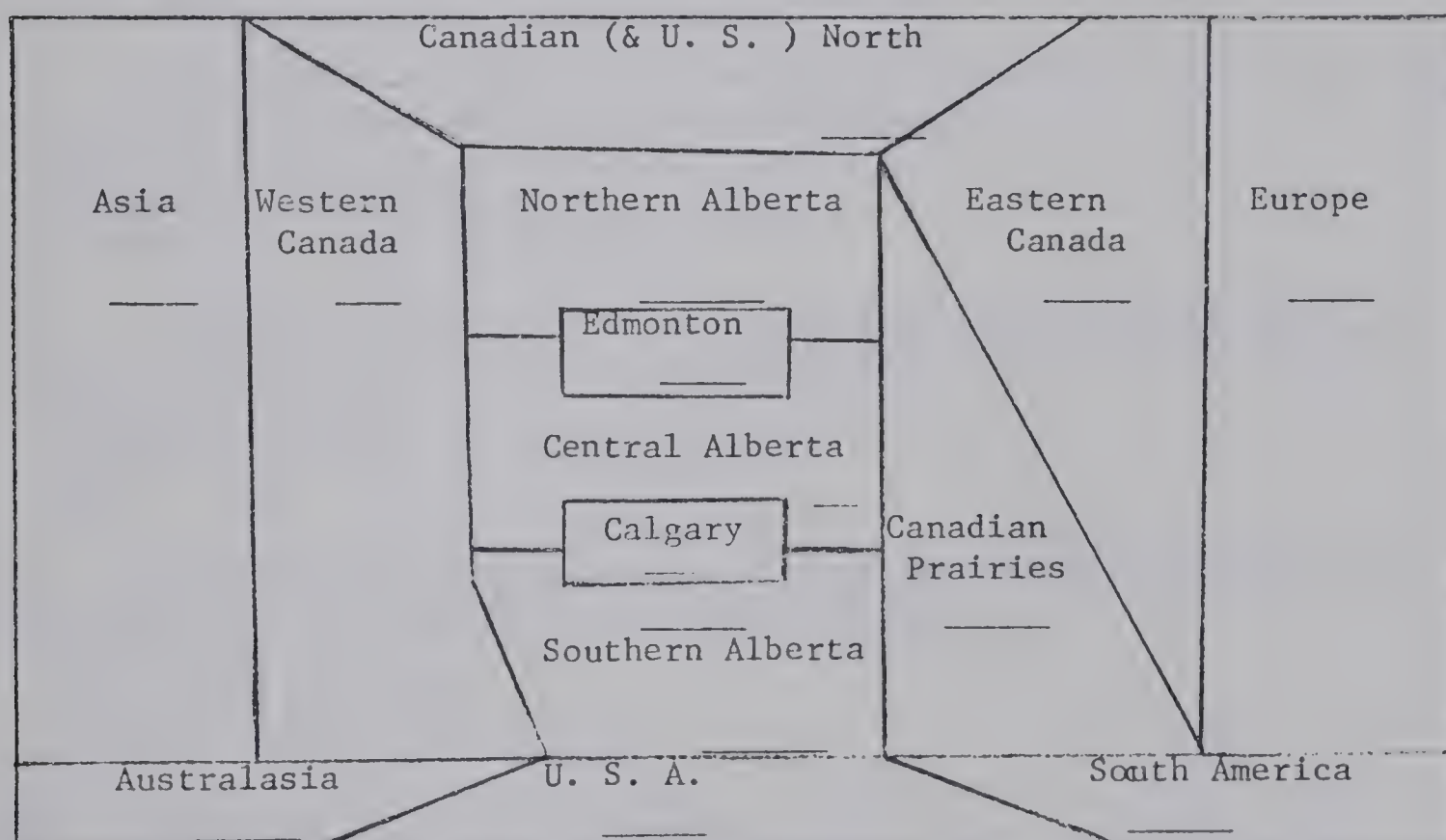
Yes _____
 No _____

38. Would the closing of the industrial airport have any effect on your firm?

Drastic effect _____
 Marginal effect _____
 No effect _____

Part VII Markets

39. On the accompanying sketch map, will you please list 1, 2, 3, in order of importance where your major markets occur. If more than 50% occur in region # 1, please indicate by circling the number. e.g. ①



Part VIII, Intra Industrial Links

40.

Are you a single plant operation or are you a branch of a multiple plant operation?

Single Plant Operation _____
 Multiple Plant Operation _____

41. Are there other plants of your firm, other than the head office located in Alberta?

Yes _____ Please Specify Locations _____

42. Do other plants of your firm perform the same function as this plant?

Exactly the same _____
 They perform the same function plus other functions _____
 They perform some of the functions as this plant but not as many _____
 They are engaged in entirely different functions. _____

43. Do you have working agreements , ie do competing firms co-operate if necessary, with other similar firms within the city?

Yes _____

No _____

44. In the event that you have to contact a competing firm for some form of assistance, do you call the same firm each time?

Always _____

Usually _____

Usually different firms _____

45. What form do most of your contacts take with your customers?

Face to face _____

Telephone _____

Letter _____

46. What form do most of your contacts take with your business associates?

Face to face _____

Letter _____

Telephone _____

47. In order, please rank 1, 2, 3, which type of contact is the most important to your business with regard to your customers?

Face to face _____

Telephone _____

Letter _____

48. In order, please rank 1, 2, 3, which type of contact is the most important to your business with regard to your business associates.

Face to face _____

Telephone _____

Letter _____

49. How important to the operation of your firm is the fact that there are other similar firms located within the city?

Very important _____

Marginally Important _____

Not important at all _____

Part 1X Conclusion

50. Below are listed 10 possible location factors. Please rank them in order of importance as you think they effect your business in Edmonton.

Close to markets - _____

Power sources available _____

Labour Sources available _____

Raw Materials available _____

Site of Plant Advantageous _____

Transportation Available _____

Nearness to similar industries _____

Edmonton is the owners home town _____

Nearness of Government Offices _____

Other, _____ Please Specify _____



APPENDIX TWO

LETTER SENT TO FIRMS REQUESTING PERMISSION TO VISIT THEM

Dear Sir;

My name is Paul Curtis and I am a Graduate Student at the University of Alberta in the Department of Geography. In preparation for writing my Master of Arts thesis I am currently engaged in a research topic in which I am trying to ascertain the effects of, and the reasons for, the concentration of firms in Edmonton which are engaged in the Oil Industry other than the operations of exploration and extraction.

To do this I have used Nickle's Oil Register to ascertain firms engaged in secondary and tertiary activities associated with the Oil Industry. From the Register I obtained the name of your company using a random sampling technique.

I wish to administer to you, a questionnaire from which I hope to obtain the required information. I appreciate that in this official census year, yet another questionnaire must appear an odious task and also that due to summer holidays, during the summer months you will probably be short staffed. To try to overcome both these points, the questionnaire has been kept as short as possible and most answers are of a "please check the appropriate response" type. By being there to personally administer it to you I hope that any ambiguities can be quickly overcome.

The questionnaire will, of course, be entirely private and at no point does the name of your company or any other firm appear since I am interested in the type of operation and not the operation itself. Also, at no point does the questionnaire refer directly or indirectly to money, profits etc...

Samples of questions are:

5. Have you become more specialized in your business since you first began your operation?
 Yes, very much more specialized **
 Yes, but only marginally more specialized ____
 No change ____

19. Are the firms to whom you sell your products
Mostly located within Edmonton ____
Mostly located outside Edmonton ** ____
27. Is labour of both types (skilled and/or unskilled) readily available
Always ** ____
Usually ____
Skilled labour hard to obtain ____
Unskilled labour hard to obtain ____
All labour hard to obtain ____
45. What form do most of your contacts take with your customers?
Face to face ____
Telephone ____
Letter ____

All together there are 50 such questions, not all of which will pertain to your particular type of operation, and the questionnaire takes between 15 and 30 minutes to complete. Of course at each question it is your prerogative to answer it or not.

Your assistance in this project would be greatly appreciated and I shall phone within the next few days to set up an appointment; the time, date or place to be at your convenience. If you are able to see me, but not during business hours i.e. in the evening, Saturday or Sunday, this will be fine.

I hope to meet you soon and explain what it is I am trying to do.

Thank you for your time and consideration.

Yours truly,

Paul J. Curtis.

APPENDIX THREE

The Standard Industrial Classification manual [1970] lists the following groupings for Canadian Industrial Firms for the purposes of reporting to the government in order that Industrial Statistics can be compiled.

064 Crude Petroleum and Natural Gas Industry

096 Contract Drilling for Petroleum

099 Miscellaneous Services Incidental to Mining

315 Miscellaneous Machinery and Equipment Manufacturers

623 Wholesales of Machinery and Equipment

864 Engineering and Scientific Services

A concerted effort was made at both the local and federal levels (by means of personal visits to the local offices and letters to the federal offices) to obtain information regarding these classifications as they pertain to the city of Edmonton. The information is, however, apparently non retrievable, that is, although individual firms are classified according to these numbers, aggregate totals including number of workers are not available for public use.

Officials at the provincial statistics office within the city of Edmonton, suggested that the total figures are aggregated with other classifications and are thus hidden within different classifications for the purposes of reporting statistics to the public. On the advice of the local office, classifications used in compiling Tables 4 - 4 and 4 - 5, pages 56 and 57 were used because it was felt that within them would be included firms originally reporting to the government in the S.I.C. numbers listed above.

APPENDIX FOUR

The speed aspect of the industry was dramatically illustrated when during the course of one interview, a telephone call interrupted the conversation. At the completion of the call the interviewee asked to be excused as an emergency call had just come through from Drayton Valley and he had to deliver a part. The interview was thus terminated in mid course and the last that was seen of the interviewee was his car receding at considerable speed down the road.

APPENDIX FIVE

Some of the establishments who listed themselves as wholesale/retail did so much to the surprise of the interviewer. For example, Nickle's Oil Register gave a title to an establishment which indicated it to be an Oilfield Construction establishment (it was also found under this classification within the Register). Upon arriving at the establishment, the advertising billboard above the door coincided with that in the Register. An advertisement on the door itself indicated the company to be a subsidiary of an oilfield transportation company whose headquarters were in Calgary. The establishment manager, however, listed his primary function as being that of a wholesale retailer. Under such circumstances the importance of face to face contacts can better be understood for without them the nature of the establishment would not be known.

While the example quoted is certainly an extreme, other surprises of a similar type were encountered.

APPENDIX SIX

At one establishment visited, questions were answered by the secretary since the owner and founder was away. The discussion later revealed that the owner was a world known figure within the industry with regard to his speciality and had visited most of the world's major oilfields to give advice or to utilise his particular skills. The company consisted of seven personnel, five of whom had moved from an already existing company with the key figure. The sixth member was the secretary interviewed and the seventh was an apprentice. In two other instances where specialised establishments were visited the owner and key members of the company had international experience in their particular field. Such may have been the case in other establishments but the information was not volunteered.

APPENDIX SEVEN

An interesting phenomenon with regard to labour turn-over especially in light of the fact that the establishments report a very stable labour force was discovered during the pretest of the questionnaire. In the case of each intended interview the letter found in Appendix Two was sent. Because Nickle's Oil Register lists key personnel by name, letters were addressed specifically to the manager or owner of the company and that person was asked for specifically by name when phoning. In three of the first five establishments phoned, the managers had left the company and one of these gentlemen was found at another establishment. This practise of naming persons was quickly abandoned. Even allowing for the fact that the data printed in Nickle's Register was probably at least four years old, turn-over at the administrative levels appears to be quite high.

APPENDIX EIGHT

Many of the newer establishments visited, especially of the smaller variety, were owned and staffed completely by Canadians. The bigger establishments usually subsidiaries of larger American companies were managed by personnel from the United States. Tid-bits of information collected from various interviews seemed to indicate that until quite recently all key personnel and many of the lesser personnel were from the U.S. and it is only recently that Canadians have developed enough skills and experience to take over or initiate establishments.

APPENDIX NINE

1. One interviewee declined to list his previous address on the grounds that he could be 'traced' and therefore the questionnaire and its responses were not anonymous and if falling into the 'wrong' hands could damage his business.
2. One interviewee declined to furnish information concerning linkages except to state that he had no contacts within the city. By pure coincidence the very next establishment visited had on its door an advertisement declaring it to be an agent for the establishment just left.
3. Information gained from one interviewee, who admitted that his own particular private concern was under tremendous pressure from a newly opened international concern, was that whenever he was visited by salesmen or agents, he made a point of covering or removing all literature from view and especially invoices that might provide clues useful to his competitors. The interviewee felt that the industry was 'over-stocked' both in terms of establishments and products, that is most brand products designed for specific purposes were of equal standard and thus the obtaining of business was based mostly on 'one upmanship'.

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